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Contents

NOTICES:—All communications relating to editorial matter should be addressed to the Editor who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Other communications relating to advertisements or general matters should be addressed to the Manager.

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The Prodigal's Return

WE may agree at once with the 177 gentlemen of science, who are anxious to see the scientists of Germany re-admitted to the international fold, that science, like art, knows, or should know, no artificial barriers of race or language. It is impartial and impersonal as Nature itself. But the people who practise science are human beings. They are subject to likes and dislikes, and, without claiming to be better than they should be, are not wholly indifferent to moral and social considerations. To enjoy the esteem and companionship of his fellows the man of science must not only be a good man in the laboratory; he must be a decent fellow outside. And the present advocates of the re-admission of Germany to the fellowship of world science must reckon with this fact. There is no boycott of German science *quâ* science; but there is a very natural difficulty in forgetting the barbarous uses of science which German scientists approved and assisted at, or at the best passively acquiesced in. The obstacle is, in a word, not scientific, but ethical. Before the war there was an International Association of Academies, by which scientific and learned societies of many nations worked for co-operation in learning and research. The question of the resumption of this international co-operation has been discussed in Paris, London, and Brussels, and it has been decided not to attempt an immediate return to the pre-war position, but to begin with co-operation among the Allies, to invite the adhesion of neutrals, and in due time to consider the resumption of relations with Germany. That is the basis on which the Inter-Allied Chemical Federation has been organised.

The majority of the signatories to the appeal, which is being addressed to members of learned societies and academies in Allied countries on behalf of a reconciliation with Germany, are Swedes, Norwegians, Danes, and Dutch. They recall the fact that just over a century ago, in spite of the wars between England and France, Humphry Davy was warmly welcomed by French men of science when he passed through France on his way to Italy, and they point out the "painful contrast" between this and the present attitude towards Germany. The explanation is supplied in the decision of the Inter-Allied scientific societies in London that co-operation cannot be restored without formal disavowal of the German methods of warfare. Without disputing or accepting the Inter-Allied view, they ask for its reconsideration. The case is put forward quite fairly and temperately, but it really takes the form of a plea for mitigation of sentence. Such pleas are generally listened to with sympathy, but they usually pre-suppose some kind of confession on the part of the persons for whom intercession is made. That is one of the difficulties here: there has been no disavowal or, indeed, any sign of regret. The German prodigal who proposes to return home still practising the "goose-step" can hardly expect a very cordial embrace. When he comes, clothed and in his right mind, his reception may be different.

A Mysterious Explosion

WE give elsewhere some details of a somewhat mysterious explosion which occurred recently at the works of the British Cellulose Company at Spondon, and as a result of which the superintendent engineer lost his life. The explosion took place during the dismantling of a column 27 feet high, an operation which had been frequently carried out, and which had only on one other occasion been attended with an accident of the kind. The column in this instance formed part of a decomposer utilised for the manufacture of acetic acid from wood pulp by a synthetic process; and, as

it was in use up to the night prior to dismantling, the necessary precaution was taken of thoroughly washing it out so as to clear away all the objectionable fumes.

The chemist to the company, endeavouring to determine the cause of the previous explosion, collected samples of a black powdery film with which the internal surface of the column was coated, and there seems little doubt that this consisted of copper acetylide. This compound, it may be mentioned, is of an uncommon nature, and comparatively little is known of its properties and behaviour. Moreover, the vessel in this case was made from brass, and this alloy is, according to general opinion, unaffected by contact with acetylene. Copper acetylide ($C_2Cu_2H_2O$) is best known in the form of the reddish precipitate which is thrown down when such substances as coal gas, containing acetylene, are passed through an ammoniacal solution of cuprous chloride. So far as the explosive properties of the compound are concerned, it is known that explosion occurs when it is heated to from 100° to 120° C., but in the present instance it is of chief interest to note that so long as the substance is dry it will explode fairly readily when struck. The fact that in the case in question a dense cloud of smoke resulted from the explosion strengthens the opinion that acetylide was the cause, for when this substance is exploded it gives rise to free carbon and copper. As regards preventive means, it would seem that as it is only the dry product which explodes, the obvious remedy is to ensure the moistening of all portions of the plant before it is handled.

Industrial Catalysis

In this issue we reprint an abstract from the book on Catalysis, which has just been published by Dr. E. K. Rideal and Dr. H. S. Taylor. The authors may well claim to give an authoritative account of this complex subject, for both were engaged for some three years on special research work in connection with catalysis for the Munitions Inventions Department. The number of processes which they have protected, either independently or in collaboration with others, speaks well for their ability in getting astride of problems which were sorely neglected in this country in the past, and it is a matter for regret that, owing to our inherent disability to differentiate (so far as salaries are concerned) between the value of the research chemist and the labourer, we have lost—it is to be hoped only temporarily—the services of these two workers. Both are now filling positions of importance in America, Dr. Taylor as lecturer in physical chemistry at Princeton University and Dr. Rideal at Illinois.

The abstract we give relates only to one of the many important branches of the problem which are dealt with in the book, but considering the subject as a whole the average reader is immediately struck by the fact that whereas the rarer substances have nearly always been recommended for use as catalysts, it has been found eventually that by promoting the correct conditions some far less valuable material may frequently be employed. For instance, in the synthesis of ammonia both Haber and the Badische Company conducted several years of patent research before obtaining satisfactory catalysts, and eventually they lighted upon osmium and uranium, both of which were afterwards found to be unsuitable for use in practice on a large scale. Finally, the solution of the problem depended upon some form of iron. Probably, the neglect of the commoner substances as catalysts is due to the fact that we are only on the threshold of our knowledge of the principle of activation by means of "promoters," while the full significance of poisons has now come to be appreciated. The most efficient promoters for iron would appear to be molybdenum, tungsten, cobalt, and uranium. Another merit of the activated catalyst is well worth noting. In 1904, when Haber first investigated the ammonia problem, he employed temperatures between 700 and 1,000 degrees, whereas with the addition of promoters the process is operative at some 250 degrees lower.

The Lyons Fair of 1920

Inquiries respecting the arrangements for the Lyons Fair show that the prospects for next year are exceedingly good, and that, as a centre of international trade, especially among Allied nations, it promises to attain a very important position. In consequence of the rapid development of the Fair it has become necessary to divide it into two sections—the Spring Fair, to be held on March 1-15, and the Autumn Fair, to be held on October 1-15. The chemical industry section, together with medical and pharmaceutical products, will be included in the former, but paints, varnishes, and other chemical products used in the building industries, are reserved for the latter. The grouping of the sections has been arranged with the object of avoiding, as far as possible, the necessity of buyers of similar articles having to visit the Fair twice in the same year.

The Lyons Fair, it may be desirable to state, is no mere exhibition, but a real commercial exchange, open to all manufacturers and wholesale buyers of Allied and neutral countries. No goods are delivered during the Fair, but orders booked by exhibitors are executed later direct from works, according to the terms of contract. From 1916, the first year in which the Fair was held, to 1919 the total number of exhibitors has increased from 1,342 to 4,700, and the number of British exhibitors from 14 to 450—rather more than one-tenth of the total number of foreign exhibitors. Next year our very natural sympathy with the French people, whose industries were devastated by the war, and the need of developing our own export trade will probably result in a large addition to the number of British exhibitors, and a corresponding extension of our international trade.

Lever Brothers Extensions

The most important trade announcement of the past week was the official statement that the directors of Brunner, Mond & Co. had agreed to sell to Lever Brothers the ordinary shares in Joseph Crosfield & Sons, soapmakers, Warrington, and William Gossage & Sons, soapmakers, Widnes, which they acquired in 1911. The sale was made at a price which the directors consider to be fair, and is payable in cash. The actual figure is not disclosed, but it is believed to be about £4,000,000. Although this rearrangement of investments will obviate the necessity for any issue of capital for a considerable time, the directors of Brunner, Mond

and Co. see no reason to anticipate that it will cause any increase in the profits earned by the Company or the amount available for distribution. The original purchase by Brunner, Mond & Co. would be calculated to enable them to supply the Crosfield and Gossage companies with the chemicals they required, and it may be recalled that in February last Lever Brothers brought an action against the other three companies, claiming that they were entitled to an equal share in the two soap businesses. The claim, however, was withdrawn, and the Judge expressed a hope that all the firms would resume friendly business relations. Joseph Crosfield & Sons is the larger of the two concerns. It has an authorised capital of £5,000,000, of which half is issued. There is £600,000 of ordinary capital, the rest being preference and pre-preference. The Ordinary Shares having been held privately, the dividends paid have not been published. William Gossage & Sons have an authorised capital of £1,276,000, of which only £525,000 is issued, and only £75,000 of that in Ordinary Shares. In this case also the dividends paid have not been disclosed. Thus the Ordinary Shares acquired amount nominally to £675,000, against a total issued capital of £3,776,000. Brunner, Mond, & Co. has an issued capital of nearly £10,000,000, of which £8,000,000 is in £1 Ordinary Shares. The market valuation of the share capital is over £20,000,000.

Another report has recently been circulated that Lever Brothers were preparing to undertake the manufacture of margarine at new works at Gretna. We have made inquiries respecting this report, and are officially informed that "there is no truth in the report that Lever Brothers have purchased the factory at Gretna."

The Chemical Industry Club

We learn that the first annual dinner of the Club (the date of which, as previously announced, is October 31) will be held at the Tallow Chandlers' Hall, 4, Dowgate Hill, E.C. 4. This hall, which dates back to the sixteenth century, is of great beauty, and, thanks to the courtesy of the Worshipful Company of Tallow Chandlers, a setting admirably suited to this important occasion will thus be provided. It is understood that the presidents of the various societies interested in chemistry and chemical industry will be present, and that representatives of the leading British manufacturers have also expressed their intention of attending. Sir William Pope, F.R.S., who is a member of the Club, is to propose the toast of "The Chemical Industry," and the only other toast to be proposed, apart, of course, from the loyal toast, is that of "The Chemical Industry Club." From what we gather of the arrangements which are being made, the dinner promises to be a most enjoyable one, and in every way worthy of the occasion. The accommodation is limited, and as the tickets will be in great demand, our readers will be well advised to make early application on receipt of their notification. Being essentially a gathering of the Club's members, it is not proposed to accommodate guests other than those officially invited.

At the annual meeting of the Club on Monday evening next, in addition to the usual business, the members will be asked to consider the advisability of electing a president. We have previously ventured to express an opinion that this step, in view of the growing importance of the Club, would be in every way desirable, but the matter, of course, is one for the decision of the members themselves. The committee's report for the year discloses a very satisfactory position. The membership on August 31 was 614, as compared with 120 a year before; the small adverse balance promises to be turned into a credit balance before the end of another year; the membership is growing, not only in numbers, but in influence, and if the present rate of progress is maintained the problem of arranging for larger premises cannot be very long deferred. These excellent results, it seems due to the committee to add, have been won by sound and energetic management.

The Calendar

Oct. 18	The Mining Institute of Scotland. "Oil Possibilities in Scotland," by H. M. Cadell, B.Sc.	The Heriot Watt College, Chambers Street, Edinburgh.
20	Institution of Mechanical Engineers. "Production," by C. H. Adams.	Institution of Mechanical Engineers, Storey's Gate, S.W.
21	Sheffield Association of Metallurgists. General Discussion on Nickel-Chrome Steels, based on Iron and Steel Institute Papers Nos. 1, 6, and 11, September, 1919.	Royal Victoria Hotel Assembly Room, Sheffield.
21	Manchester Municipal College of Technology. "Site, Lay-out and Construction of Chemical Works," by J. Allan (Joseph Crosfield & Son, Ltd.).	
21	Institution of Petroleum Technologists. "Some Laboratory Tests on Mineral Oils," by Arnold Philip, B.Sc.	Royal Society of Arts, John Street, Adelphi, W.C. 2.
23	Society of Chemical Industry. Council Meeting, 2.30; General Meeting, 4.30.	Central House, Finsbury Square, E.C. 2.
28	Sheffield Association of Metallurgists and Metallurgical Chemists. "Some Microscopical Effects of Static and Dynamic Stresses," by G. R. Bolsover, Assoc. Met.	Royal Victoria Hotel Assembly Room, Sheffield.
28	Manchester Municipal College of Technology. "Site, Lay-out and Construction of Chemical Works," by J. Allan (Joseph Crosfield & Son, Ltd.).	
31	Chemical Industry Club. First Annual Dinner.	Tallow Chandlers' Hall, E.C.
Nov. 1	Institution of Automobile Engineers.	Royal Society of Arts, John Street, Adelphi, W.C.
4	Manchester Municipal College of Technology. "Paint Grinding," by W. H. Barnes (Follows & Bate, Ltd.).	
4	Sheffield Association of Metallurgists and Metallurgical Chemists. "Welding," by H. Brearley.	Royal Victoria Hotel Assembly Room, Sheffield.
7	Society of Chemical Industry. (*a*) The Estimation of P-Phenylene Diamine. By T. Callan, M.Sc., Ph.D., and J. A. R. Henderson, D.Sc. (*b*) The Estimation of Sulphuric Acid in the presence of Organic Sulphonic Acids. By T. Callan, M.Sc., Ph.D., J. A. R. Henderson, D.Sc., and R. Barton, Esq.	Grand Hotel, Manchester.

Catalysts for the Fixation of Nitrogen

By E. K. Rideal, M.A., and H. S. Taylor, D.Sc.

The following abstract from a chapter on "Catalysts for the Fixation of Nitrogen" is reproduced, by permission of the publishers, Messrs. Macmillan & Co., Ltd., from a noteworthy new work on "Catalysis in Theory and Practice," by Dr. E. K. Rideal and Dr. Hugh S. Taylor. The authors are already known to our readers as contributors of technical articles to THE CHEMICAL AGE, *and their new volume, which we propose to review in due course, undoubtedly supplies a long-felt want.*

DURING the last ten years several technical solutions to the so-called nitrogen problem have been put forward and developed. The tremendous increase in the demand for nitric acid and nitro-explosives necessitated by the world-war has stimulated research and attracted public attention in a manner which, unfortunately for England, Sir William Crookes's presidential address to the British Association in 1898 failed to do. It is to be hoped that in the near future our economic safety, which is chiefly dependent on agriculture, will be assured by the erection of suitable plant either under national control or through the enterprise and initiative of English manufacturers.

The Haber Process

The technical production of pure ammonia by the catalytic combination of nitrogen and hydrogen must be considered as one of the greatest triumphs of modern physical and engineering chemistry. In 1865, Deville observed that the decomposition of ammonia under the influence of a spark discharge was never complete, thus indicating the reversibility of the reaction :

$$2NH_3 \rightleftharpoons N_2 + 3H_2.$$

The recent communication of Prof. C. Matignon to the inaugural session of the "Société de Chimie Industrielle" presents a very great interest to all concerned in ammonia synthesis in particular and also in the application of science to industry in general. The communication records a research into the scientific literature and more especially the patent literature concerning the production of ammonia from its elements.

In 1904, the subject was taken up by Haber and his co-workers, especially Van Oordt and Le Rossignol, and was carried to the stage of a complete technical success by the Badische Anilin- and Soda-Fabrik at Oppau. Haber first investigated the equilibrium conditions obtaining between a mixture of nitrogen, hydrogen and ammonia at varying temperatures. Equilibrium was obtained by the passage of nitrogen and hydrogen over various catalytic materials, and was also arrived at from the other side by the decomposition of ammonia. As catalytic materials, iron, nickel, chromium, and manganese were used at temperatures ranging between 700° and 1000°.

The exact details of the process developed by the Badische firm are carefully guarded national secrets. During the period of the war, small experimental Haber units have been at work in all the allied countries, and have gone far to confirm the statements published from time to time by the Badische Company as to the relative merits and disadvantages of the process.

The following considerations will indicate briefly the nature of the fundamental problems involved. The cost of the preparation of the gases, and more especially of the hydrogen of a sufficiently high degree of purity, constitute more than 75 per cent. of the working costs; and it may be stated definitely that the commercial possibilities of the synthetic process rest on the production of pure hydrogen at an economic rate. The Badische Company developed the water-gas catalytic process for the production of their hydrogen, the nitrogen being obtained by the fractional distillation of liquid air. An alternative method of producing the desired 3 : 1, $H_2 : N_2$ mixture would be obtained from a special semi-water-gas plant, in which the air-steam blows and makes were so adjusted, and the gaseous products mixed, as to give the desired mixture after the catalytic operation was completed.

It may be pointed out that this latter method, although possibly more economical than the dual process, would involve the presence of a not inconsiderable quantity of inert gas, *e.g.* argon, neon, and the like. The carbon dioxide is removed by counter-current washing with water under pressure, subsequently followed by an alkali scrubber to remove the hydrogen sulphide and the final residue of carbon dioxide, whilst the 2—3 per cent. of the carbon monoxide is nearly, but not completely, eliminated by scrubbing the gases compressed to 70 atmospheres with a 25 per cent. caustic soda solution maintained near its boiling point under pressure. Under these conditions, sodium formate is formed according to the equation :

$$NaOH + CO = H . CO . ONa.$$

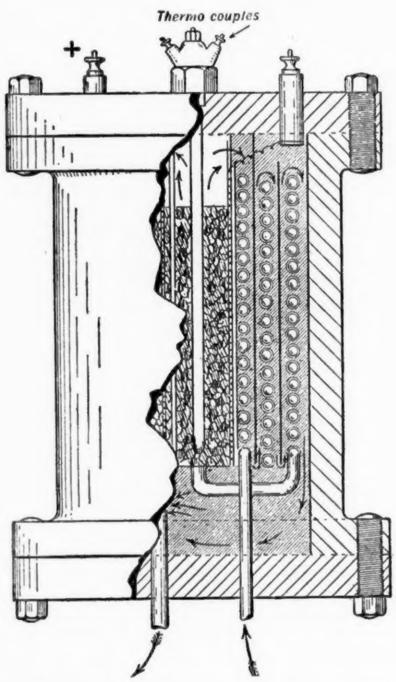
Removal of the carbon monoxide is completed by scrubbing the gas mixture with cuprous ammonium carbonate solution, the pressure being still maintained; and the resulting nitrogen-hydrogen mixture is now free from all impurities except the inert gases and possibly traces of methane, oxygen, or carbon monoxide and water vapour. To ensure the absence of oxygen and carbon monoxide, the gases may be passed over nickel maintained at relatively low temperatures, so as to form methane from any carbon monoxide and water from any oxygen present in the gases. The mixed gases are now further compressed from the 70 atmospheres at which carbon monoxide removal is accomplished to between 100 and 200 atmospheres, probably 150, at which pressure the ammonia synthesis is accomplished. During compression, most of the water vapour in the gas is removed, and the remainder is eliminated by the use of calcium chloride, and possibly other dessicating agents such as metallic sodium or sodamide. The gases are now ready to pass to the catalyst furnace itself. It has already been pointed out that the equilibrium amount of ammonia obtainable at a given gas pressure is greatly increased by lowering the gas temperature, but, unfortunately, the sensitiveness of the reaction velocity to the lowering of the gas temperature is also extremely marked. Both Haber and the Badische Company conducted several years of patient research before obtaining satisfactory catalysts active at low relative temperatures. Both osmium and uranium (including uranium carbide, the usual technical preparation) were found to be excellent catalysts, being still quite markedly active at 350°, but owing to the high cost of the former and the great sensitiveness of the latter substance even to minute traces of catalytic poisons, their technical utilisation could not be considered.

Iron as a Catalyst

The solution of this problem appears to have been found in the use of some form of an iron catalyst. The activity of iron as a catalyst for the ammonia synthesis is greatly dependent on its method of preparation, together with the presence of certain promoters and the entire absence of

certain catalyst poisons. A study of the recent patent literature on the subject reveals the fact that molybdenum, tungsten, cobalt, and uranium appear to be the most efficient promoters for the iron catalyst, while the presence of small quantities of alkalies appears advantageous; as poisons, sulphur, selenium, tellurium, phosphorus, arsenic, boron, lead, zinc, bismuth, tin, and carbonaceous substances, *e.g.* plain lubricating oil, are specially mentioned. Gentle ignition of the mixed nitrates, followed by reduction at a low temperature and subsequent cooling in a current of pure ammonia, is the most usual method of preparation. Such catalysts, it is stated, exert considerable activity at 450°, but are usually operative at 500°–600°.

The early units constructed for containing the catalyst were apparently externally heated, but owing to the weakening of the furnace walls by the action of the hot hydrogen on the steel, with the subsequent liability to explosion, internal electrical heating was adopted. The modern furnaces probably follow Haber's earlier designs of experimental



furnaces (see fig.) in which the catalyst was contained in a thin steel vessel, the pressure being the same inside and out, all danger of collapse being thereby avoided. The tube was electrically heated, and surrounded by a set of heat interchange coils, the whole being inserted in an internally lagged massive steel pressure container.

Since the reaction itself is exothermic the supply of electric energy to be continuously supplied is but small and under certain conditions may be entirely dispensed with. It will be evident that the difficulties of making large individual units necessitate that a given volume shall produce the maximum yield of ammonia per unit of time, the space time yield being all important.

Efficiency of Conversion

The gases, after entering the catalyst furnace, pass through the coils of the heat interchangers and enter the catalyst chamber at from 500°–600°. From 3–7 per cent. conversion into ammonia is the actual transformation effected, depending on the various factors, such as (*a*) pressure, (b) temperature of operation, (c) how far equilibrium is established; this in turn depending (i) on the activity of the catalyst at the temperature employed, and (ii) on the time of contact of the gas with the catalyst. The effluent gases, having given up most of their heat when passing over the heat interchanger system of tubes, leave the furnace. It is evident that the conversion is relatively so small that the unchanged gases cannot be allowed to escape. A circulatory system is therefore necessary. Accordingly, the ammonia is more or less partially removed from the gases whilst still under pressure either by liquefaction or by absorption by water on the counter-current system. The gases are then dried, passed over palladium asbestos, to remove any traces of oxygen accidentally admitted by the circulating pump or from the water, and then returned to the catalyst furnace. The pressure on the circulating system is continually maintained by the admission of fresh purified gas.

The inert gases (argon and methane) will naturally accumulate in the system, and must be blown off, causing the simultaneous loss of both hydrogen and nitrogen, which must be replaced by fresh gas. It will be noted that, apart from the exceedingly important questions of grain size of catalyst, the requisite optimum interstitial velocity (governing the actual shape of the catalyst chamber), and the efficiency of thermal regeneration, the maximum output per unit of volume at any given temperature will depend on two factors, *viz.* catalytic activity and velocity of gas circulation. It has been shown that nearly 25 kilos of ammonia can be produced per hour per litre of catalyst space at 150 atmospheres when uranium is used as catalytic material (at a temperature of 550°) with a circulation velocity of 10^6 litres per hour of gas per litre of catalyst space. According to published information, equally good results may be obtained with an activated iron catalyst when slightly higher temperatures and higher circulation velocities are employed.

As in most catalytic operations, no general formulation of the mechanism of catalysis can be laid down, but the following points may be noted in connection with this process:

(1) The most active catalytic metals are those possessing a high molecular weight;

(2) Surface absorption is not the only factor involved, since the alternate passage of hydrogen and nitrogen over the catalytic material will give good yields of ammonia;

(3) The formation of both nitrides and hydrides has been shown to occur with many of the catalysts employed.

Either on the "adsorption" or "intermediate compounds" theory, the function of the promoter is evidently based on its power of correcting the composition of the absorbed layer or forming the correct nitride hydride complex in the catalyst mass.

Catalysts Employed for Cyanamide

In 1894, Moissan showed that calcium carbide, when pure, could not absorb nitrogen up to 1200°, but in the next year Frank and Caro's experiments on technical carbides containing the usual impurities showed that rapid absorption could be obtained below 1100°, and thus laid the foundation of a very large industry. It was at once evident that the presence of catalytic substances materially hastened the process of absorption and permitted the reaction to proceed at a lower temperature. This latter point is specially important, as the absorption of nitrogen by alkali and alkaline earth carbides proceeds by two reversible reactions:

$$CaC_2 + N_2 \rightleftharpoons CaCN_2 + C$$
$$CaC_2 + N_2 \rightleftharpoons Ca(CN)_2 .$$

The quantity of cyanide formed always increases as the temperature is elevated, but is practically negligible in amount for calcium carbide up to 1100°. Any effective lowering of the temperature employed will thus effect an economy in the utilisation of both heating energy and nitro-

gen, as well as a simplification of the technical operations.

It was not until 1906, however, that the utility of adding any specific catalytic material to hasten the absorption of nitrogen was suggested. Carlson proposed the use of calcium fluoride, and Polzenius that of the chloride.

The subject was carefully investigated by Bredig and Fränkel, who determined the effect of the addition of 10 per cent. of catalytic material on the quantity of nitrogen absorbed in two hours at various temperatures. At 800°, the addition of 10 per cent. of calcium chloride effected a 22 per cent. absorption, whilst 10 per cent. of lithium chloride effected 17 per cent. absorption, the carbide alone only absorbing some 3 per cent. The chlorides of the other elements of the alkalies and alkaline earths were not so active, their efficiency falling off with the increase in their atomic weights.

From these and other investigations, it appears that the chief function of the catalyst is to act as a fusible solvent for the calcium carbide. Not only does the absorption of nitrogen proceed more rapidly in the flux, but at the same time fresh surfaces of the unfused calcium carbide are expressed to the action of the nitrogen by the removal of the reaction products. According to Foerster and Jacoby, the unchanged lime in the commercial carbide also exerts a catalytic activity by producing incipient softening at 1100°, thus offering an explanation of Moissan's results. Calcium chloride has a greater solvent action on the carbide than calcium fluoride, possibly on account of its lower melting point, and is thus a more effective catalyst.

The use of potassium carbonate (4 per cent.) has been suggested by Pollaci, whilst recently the use of the relatively cheap sodium chloride has been advocated as the most suitable catalyst for operation on a technical scale. But little is known about the solubilities of calcium carbide, cyanamide, and nitrogen in these various solvents, and no determinations appear to have been made on the velocities of the reaction in such solvents, subjects which might very well repay investigation.

Preparation of Nitrides

The only technical production of nitrides from atmospheric nitrogen was accomplished by Serpek in the Savoy. Although certain difficulties militated against the economic success of his earlier plants, yet, on account of the apparent possibilities of some such process, some allusion must be made to Serpek's work.

Serpek's process was based upon the following reactions, obtaining aluminium nitride by the simultaneous reduction and azotisation of the oxide :

$$2Al_2O_3 + 6C \rightleftharpoons 4Al + 6CO$$
$$4Al + 3C \rightleftharpoons Al_4C_3$$
$$4Al + 2N_2 \rightleftharpoons 4AlN$$

Caro's investigations have shown that the dissociation temperature of the nitride is higher than that of aluminium carbide, and consequently the nitride is actually formed through the intermediary of the metal.

The optimum temperature for nitrogen absorption was found to be between 1800° and 1900°; above 2000°, dissociation of the nitride commences.

Serpek's later experiments indicate that the temperature for rapid azotisation could be considerably reduced by the addition of certain catalytic material. His earlier claims as to the efficacy of the addition of small quantities of hydrochloric acid or sulphur dioxide to the nitrogen could not be substantiated, but a small quantity of hydrogen appears to exert a considerable catalytic activity. More important is the addition of catalysts to the solid reacting phase, such as the addition of small quantities of copper, iron, or manganese to the alumina. Serpek obtained good results with natural French bauxite rich in iron. Fränkel conducted a series of experiments on the relative activities of various forms of carbon, and arrived at the conclusion that finely divided carbon, such as soot, was most effective, rapid absorption taking place between 1500° and 1600°.

The Badische Company, in a series of patents, protect the use of catalytic agents other than copper and iron, and more especially the oxides of those elements which form stable nitrides, on reduction and azotisation, such as chromium, uranium, vanadium, molybdenum, zirconium, titanium, and silicon.

The Cyanides

The recently published investigations of Bucher on the use of finely divided iron as a catalyst in the absorption of nitrogen by a hot mixture of sodium carbonate and coke for preparing sodium cyanide has led to an increased amount of attention being given to the old, and as yet unsolved, problem of the economic absorption of nitrogen to form cyanides. Since the market value of fixed nitrogen in the form of cyanide is greatly in excess of its actual value on the nitrogen content as a fertiliser, repeated attempts have been made to replace the somewhat costly Castner process, which utilises expensive raw materials such as sodium and ammonia, by some method in which atmospheric nitrogen could be utilised.

In reality, this problem had long received a great deal of attention by various investigators, and it remains to the credit of Possoz and Boissière that they erected the first nitrogen fixation factory in the world at Newcastle in 1843. The process utilised was one which even then had long been known, *viz.* the reaction between alkalies and alkaline earths with carbon and nitrogen to form cyanides at high temperatures, as was noted by Deforres in 1828, by Clark in the Clyde furnaces (in which potassium cyanide was isolated by Bunsen and Playfair in 1845.

The formation of sodium cyanide occurs according to the following equation :

$$Na_2CO_3 + 4C + N_2 = 2NaCN + 3CO.$$

Very high temperatures are required to produce even a small conversion. To obviate the difficulties attendant on the use of high temperatures and to obtain a more reasonable conversion, the employment of various catalytic materials was soon suggested.

Thompson, in 1839, directed attention to the catalytic effect of finely divided iron. The catalytic effects of other metals, especially manganese and chromium, were noted by Margueritte and Sourdeval in 1860, and by Swan and Kendall in 1845. Bucher has recently re-investigated Thompson's process and claims to obtain the rapid absorption of nitrogen in producer gas at a temperature of 900° by briquettes containing sodium carbonate, coke, and iron as a catalytic material. Margueritte and Sourdeval suggested the use of barium carbonate, instead of sodium or potassium, as absorption of the nitrogen is more rapid. Readmann, in 1895, developed the process and obtained good technical yields of barium cyanide according to the equation :

$$BaO + 3C + N_2 = Ba(CN)_2 + CO.$$

The optimum temperature of absorption was stated to be 1400°. Swan and Kendall, a few years later, modified the process by the addition of certain catalysts, such as the oxides of titanium, molybdenum, chromium, and manganese, to the charcoal-alkaline-earth mixture before the absorption of the nitrogen. It is stated that with these catalysts the formation of cyanide will commence at a dull red heat.

At the present time no technical process for the preparation of cyanides by these methods is in operation. The reactivity of the fused alkalies towards all materials capable of withstanding the high temperatures and the difficulties associated with the removal of a partly fused mass of cyanide from furnaces appear to militate against successful operation. The U.S. Government, however, has made a substantial grant in aid of technical research.

Industrial Possibilities of Water-proofed Papers

By Judson A. Decew

The substitution of paper products for wooden products which is gradually taking place is a development largely dependent upon the ability to make the paper products as strong and resistant to destructive agencies as the special product requires. Great strides have already taken place in this direction, in spite of the fact that the methods used in imparting the special properties to the paper products are yet in a relatively undeveloped state.

Owing to the increase in cost and lower quality of lumber now obtainable, there is a strong incentive to use the inferior woods and waste papers to make products that will replace the ordinary wooden products with which we are familiar. For example, pasted paper products are used extensively as boxes to replace the ordinary wooden box. Paper barrels are now made, by special machinery, by winding up and pasting a roll of paper into suitable cylindrical shapes and attaching heads to them. Paper pails are made by pressing wet pulp into a solid pail, or by winding the paper into a pail while pasting it together. Wall-board is a product which is made by pasting layers of paper together, and which is used for walls, ceilings, and interior finishing, in place of high-grade lumber. The uses of this product will be greatly extended as soon as the methods of making it waterproof are sufficiently perfected to enable it to be used in places exposed to the weather. Pulp products are now made, in the shape of board, which are fairly water-resistant and very light in weight, and these are used as insulating materials.

Waterproof papers have been used recently to a great extent in lining cases, where products are exported. One of these is made of two sheets of thin paper with a layer of pitch between them. Many papers are used either waxed or oiled, because the methods of making paper waterproof on the paper machine are not yet sufficiently well known. Waxing paper is an expensive process, for the original paper takes up from 10 per cent. to 40 per cent. of wax in the process, and the strength of the product is generally reduced about 20 per cent. Oiled paper has a limited use owing to the difficulty of keeping the oil in the paper after it is put there. This paper is used a lot in the packing industry, but its uses are limited, as it is an unpleasant product.

Paper packages which have been waxed after being made are very familiar to all, but such packages are unsuitable for some uses. Waxed containers are not suitable for holding greases, such as butter and lard. They are also unsuitable for canning, as they cannot be heated. During the late war there was a great demand for paper cans that could be substituted for metal ones, but a paper can that would stand the heating process, to which the metal can is subject, was not produced.

The Engineering Features of Paper Products

The engineering features connected with the future development of paper products may be considerable, and it may be of interest to note some of the tendencies at the present time and the problems that affect their development.

During the rush period of the war a large amount of the paper wall-board and plaster-board was used in Government construction for cantonments and other temporary buildings. Perhaps some of the paper-board was, at first, improperly made or improperly used, but, if disappointment occurred, it does not follow that satisfactory fibre-board products cannot be produced for these many purposes of construction. Paste-board has some properties that make it desirable for special conditions.

Wall-board has also been used as a substitute for lumber when made into forms for concrete, and it may be used in constructions, not only to act as ceiling but also as the bottom of a concrete floor above. At the present time, manufacturers of wall-board seem to be content to develop the markets for interior use only, although it is known that a really waterproof product can be made, as a result of improvements in the present processes. Newer developments and applications, therefore, will follow the production of a standardised product, which will withstand the influences of the weather and which can be safely used by engineers for outside construction. There are manufacturers preparing, at the present time, to produce such a material, and, as it can be made from either ground wood or old paper stock, it is evident that there will be no limit to the possible production of lumber substitutes.

Methods of Production

There are three problems to be solved, if it is desired to make the pasted board entirely waterproof. First, the paper, as it comes from the paper machine, must be made thoroughly water-resistant by the use of special sizing materials, which are added to the pulp in the beating engine; second, these layers of waterproof paper must be pasted together by means of a water-soluble material, which becomes insoluble on drying; and thirdly, but of less importance, the surface of the pasted board may be coated with a water-resistant material. Some manufacturers do not attempt either to size the paper product or to use a waterproof binder, but depend entirely on a small amount of surface coating to retard the penetration of water, in the form of vapour. Other manufacturers do their best to waterproof the original paper product, but, like all of the others, paste these layers together by means of silicate of soda, which is a strongly alkaline material, and the manner in which it is used injures the water-resistance of the paper itself.

The use of surface coatings is more varied in practice but is limited in its application, owing to the fact that if waxy or oily coatings are applied to any extent, then the product, when used for interior decoration, will not take the proper surface sizing before paint is applied.

Owing to the improvements in methods of waterproofing paper, by treating it before it is formed on the machine, and also the development of special organic products for pasting it together, which will become insoluble on drying, we can now safely say that the problem of making a thoroughly waterproof board has already been solved, and merely awaits the application of these processes which are now perfected.

With regard to the properties of this new board product, I may say that it is possible to make it sufficiently waterproof so that it will not absorb 20 per cent. of moisture after several hours' immersion in water. This means that it will never take up sufficient water to weaken its structure so that it will fall to pieces, and, consequently, will be a satisfactory substitute for lumber. We must remember, on the other hand, that lumber is easily wetted until it has doubled its weight by the absorption of water, and that under these conditions it loses about 50 per cent. of its original strength. While absorbing this water it will expand considerably, and during the drying process will suffer considerable distortion. In considering the properties of paper board, therefore, we must compare it with the more or less unsatisfactory material that we commonly use, whose factors of distortion are greater than with the artificial product.

Painting does not keep lumber dry any more than it will be an absolute protection for a lumber substitute. In the manufacture of a paper product, however, it is possible to incorporate waterproofing materials into the fibrous mass so that the product, when dried on the machine, is exceedingly water repellent, which property does not exist in natural woods. In the artificial product the strength factor may be less, but it will be subject to less variation under normal conditions.

Waterproof Paper

There are many coming uses for a waterproof wrapping paper which is also strong and pliable in character. The greatest possibilities are in connection with the substitution for canvas and cloth. Such papers are already being made by treating specially strong paper with impregnating or coating materials. These paper products are, of course, expensive, but this is due to the fact that valuable products and heavy coatings are required to make paper so that it does not take up any moisture at all. Paper which will hold water for many hours, and in this sense may be called waterproof, can be made on the paper machine, and this may also be very strong and pliable in character.

A crimped paper that is waterproofed, by impregnation, and sewed into bags, is very serviceable for many purposes, and is already on the market in considerable quantities. A similar paper can be made, with like waterproof qualities, by special sizing materials incorporated in the paper stock during manufacture. Such a product, however, is not yet in general use.

It is very difficult to make a paper product that will not absorb moisture, and thus expand and contract to some extent. Paper and board can, without difficulty, be made so that it will resist the further penetration or absorption of water after its fibres have taken up a small quantity of moisture, equal to about one-fifth its weight. The manufacture and use of these latter products should greatly increase, as they are sufficiently waterproof for most commercial uses.—*Pulp and Paper Magazine* August, 1919.

Annual Board of Trade Returns (III)

Chemical Exports for the past Five Years.

We publish below the concluding instalment of the quantities, and value of exports of chemicals, drugs, dyes, colours, etc. (Foreign and Colonial):—

EXPORTS OF ARTICLES OF FOREIGN AND COLONIAL MERCHANDISE.

(Articles subject to Duty on Exportation are printed in *Italics* in the first column.)

ARTICLES.		QUANTITIES.					VALUE.				
		1914.	1915.	1916.	1917.	1918.	1914.	1915.	1916.	1917.	1918.
							£	£	£	£	£
Asbestos, Raw	Cwts.	10,156	55,522	68,585	49,751	16,331	12,821	58,807	106,767	107,871	41,475
Asphalt, or Bitumen (other than Painters' Colours or Drugs) ..	Tons	3,246	10,259	7,011	1,018	18	12,865	56,556	51,605	11,264	377
Chemical Manufactures and Products (other than Drugs, Dye Stuffs, and Manures) not liable to duty:											
Acetate of Lime	Cwts.	2,299	—	—	—	49	1,049	—	—	—	121
Acetic Acid, other than for table use	,,	—	884	2,724	1,438	745	—	2,210	15,374	9,538	5,100
Acetone	,,	1,163	577	—	20	1,980	3,679	3,009	—	180	15,212
Bleaching Materials:											
Bleaching Powder	,,	2,502	4,793	3,841	109	—	690	3,398	2,924	174	—
Other Bleaching Materials ..	,,	—	—	—	—	—	—	—	—	—	—
Boracite	,,	12,400	9,368	—	—	—	5,570	4,028	—	—	—
Borate of Lime	,,	1,900	9,405	2,840	414	—	900	4,257	2,889	500	—
Borate of Magnesium	,,	—	—	—	—	—	—	—	—	—	—
Borax	,,	—	611	5,771	801	815	—	636	7,949	1,222	2,612
Brimstone	,,	17,553	61,020	170,517	25,279	598	5,739	21,785	90,698	19,368	878
Carbide of Calcium	,,	1,469	3,711	5,668	6,842	8,251	1,097	2,843	5,414	8,997	13,849
Coal Products, not Dyes ..	,,	4,968	5,816	7,644	2,028	323	6,657	11,206	22,773	20,885	5,500
Cream of Tartar	,,	9,222	12,905	11,552	9,924	12,383	51,138	96,278	98,057	90,566	174,840
Glycerine—Crude	,,	14,507	6,493	—	—	—	41,819	18,377	—	—	—
,, —Distilled	,,	75	1,018	6,081	—	—	314	4,072	23,090	—	—
Muriate of Ammonia	,,	402	—	—	—	—	814	—	—	—	—
Potash Compounds:											
Saltpetre (Nitrate of Potash) ..	,,	7,833	52,084	114,114	68,331	58,127	7,869	89,262	204,116	138,277	124,075
Other Sorts	Value	—	—	—	—	—	33,790	52,408	49,409	22,516	31 733
Soda Compounds:											
Soda Ash	Cwts.	1,195	—	953	799	904	304	—	1,332	450	1, 130
,, Bicarbonate	,,	—	—	2	—	—	—	—	2	—	—
,, Caustic	,,	1,297	625	18,875	14,947	—	767	332	25,358	28,953	—
,, Crystals	,,	—	34	10	—	—	—	40	2	—	—
,, Other Sorts	,,	5,566	12,551	8,801	7,692	18,761	7,892	23,374	27,696	20,598	55,334
Sulphuric Acid	,,	—	—	—	1,071	170	—	—	—	4,400	400
Tartaric Acid	,,	4,717	2,109	11,555	2,547	640	26,779	21,603	212,545	39,068	10,085
Unenumerated	Value	—	—	—	—	—	103,947	194,694	346,536	320,189	464,784
Chicory, Raw or Kiln-dried ..	Cwts.	—	37	—	1,930	—	—	58	—	5,725	—
,, *Roasted or Ground* ..	Lbs.	172,200	643,700	849,084	906,792	—	1,926	13,878	16,094	23,498	—
Chicory, Other Vegetable matter applicable to the uses of Chicory, or of Coffee	Cwts.	—	80	—	—	—	—	120	—	—	—
Chloral Hydrate	Lbs.	1,719	14,811	23,629	5,474	1,398	260	4,613	11,503	2,543	669
Chloroform	,,	246	50	—	—	—	44	18	—	—	—
Drugs, containing no dutiable ingredient:											
Bark, Peruvian	Cwts.	15,188	7,220	8,940	15,669	26,846	32,008	20,638	39,397	109,343	271,665
Cocaine and Cocaine Salts ..	Ozs.	11,996	8,144	34,653	9,089	1,737	2,224	2,748	18,707	6,837	3,967
Morphia and Morphia Salts ..	,,	80	6,830	—	200	630	32	4,458	—	230	970
Opium	Lbs.	251,525	168,572	134,201	125,236	80,572	238,518	180,913	164,620	259,857	240,184
Quinine and Quinine Salts ..	Ozs.	82,865	701,055	219,805	1,403,547	1,562,970	4,676	85,807	48,816	162,855	187,045
Unenumerated (including medicinal preparations)	Value	—	—	—	—	—	425,959	609,696	1,053,992	785,151	689,588
Dye Stuffs (other than Dye Woods) and Substances used in Tanning or Dyeing:											
Dye Stuffs:											
Cochineal	Cwts.	720	1,117	4,596	508	832	6,526	10,161	60,292	6,872	13,164
Cutch	,,	17,792	58,091	66,576	21,693	6,130	22,098	87,682	147,058	48,314	19,227
Dyes and Dye Stuffs obtained from Coal Tar:											
Alizarine and Anthracene Dye Stuffs	,,	56	36	4	—	—	176	193	124	—	—
Aniline and Naphthalene Dye Stuffs	,,	2,258	258	266	639	383	11,197	4,001	11,396	20,440	13,894
Synthetic Indigo	,,	—	73	49	3	—	—	4,075	5,134	165	—
Other Coal Tar Dye Stuffs ..	,,	—	—	—	269	—	—	—	—	2,170	—
Extracts for Dyeing	Value	—	—	—	—	—	9,533	77,318	53,135	117,639	114,964
Indigo	Cwts.	1,896	8,026	19,433	11,226	6 962	51,249	467,213	980,554	591,958	351,679
Unenumerated	,,	8,524	5,335	10,867	8,715	1,485	16,524	15,057	29,510	22,965	12,282
Tanning Substances:											
Bark for Tanning	,,	600,496	301,029	212,479	15,414	4,992	235,687	130,734	129,784	13,838	5,398
Extracts for Tanning ..	Value	—	—	—	—	—	39,004	721,255	1,135,317	267,772	4,365
Gambier	Cwts.	24,807	27,145	48,984	9,911	658	29,828	42,280	120,742	24,503	2,107

EXPORTS OF ARTICLES OF FOREIGN AND COLONIAL MERCHANDISE—*continued*.

(Articles subject to Duty on Exportation are printed in *Italics* in the first column.)

ARTICLES.		QUANTITIES.					VALUE.				
		1914.	1915.	1916.	1917.	1918.	1914.	1915.	1916.	1917.	1918.
							£	£	£	£	£
Tanning Substances—*continued*:											
Myrobalans	Cwts.	14,270	24,511	35,479	761	4,460	5,232	12,055	26,797	556	4,749
Sumach	,,	7,706	10,629	14,276	214	—	3,952	6,146	9,420	214	—
Valonia	,,	3,398	892	—	—	—	1,987	673	—	—	—
Unenumerated	,,	3,127	8,382	7,971	2,285	—	1,550	4,983	6,621	2,283	—
Ether, Acetic	Lbs.	687	—	166	—	—	25	—	15	—	—
,, *Butyric*	Gallons	—	—	—	—	—	—	—	—	—	—
,, *Sulphuric*	,,	222	10	—	—	—	86	7	—	—	—
Ethyl, Bromide	Lbs.	—	—	—	—	—	—	—	—	—	—
,, *Chloride*	Gallons	9	22	42	40	28	55	195	810	649	503
,, *Iodide*	,,	—	—	—	—	—	—	—	—	—	—
Glass:											
Window and German Sheet, (including Shades and Cylinders)	Cwts.	4,936	9,031	41,192	19,890	9,590	3,069	10,434	46,836	32,245	25,307
Plate	,,	1,526	4,042	6,126	398	141	2,380	5,889	12,362	1,116	1,335
Flint, plain, cut, or ornamented, and other Manufactures of Flint Glass (except bottles)	,,	10,958	7,863	15,086	5,796	2,130	32,573	29,424	57,711	24,598	13,038
Bottles	Gross	34,644	27,149	15,913	6,592	1,883	20,018	20,664	14,531	4,716	2,545
Manufactures, unenumerated	Cwts.	604	665	381	12	—	1,884	3,980	614	32	—
Glue, Size and Gelatine not containing added Sugar	,,	16,555	3,778	5,943	7,780	2,925	27,469	16,719	24,812	50,798	31,170
,, Stock, and pieces for making Glue	,,	59,446	23,883	9,391	5,065	—	50,639	24,980	7,257	4,613	—
Gum, Arabic	,,	44,354	44,396	63,578	47,365	7,983	81,685	97,338	176,416	141,492	33,419
,, Kauri	,,	77,193	51,369	32,570	12,412	336	340,112	263,775	179,594	73,985	1,405
,, Lac-dye, Seedlac, Shellac, and Sticklac	,,	46,684	41,027	80,574	13,762	16,235	166,574	143,103	395,307	116,656	123,240
,, Unenumerated	,,	72,188	105,902	151,325	131,416	12,169	151,258	257,682	392,031	412,357	79,282
Gutta Percha	,,	8,856	8,821	5,619	3,515	2,478	118,633	75,576	68,499	50,722	43,697
Manures:											
Basic Slag	Tons	1,963	—	—	—	—	4,982	—	—	—	—
Bones for Manure (whether burnt or not)	,,	4,724	5,873	2,694	110	—	28,625	42,878	27,682	1,241	—
Guano	,,	3,812	3,760	1,014	350	—	28,074	34,903	12,353	4,655	—
Nitrate of Soda (Cubic Nitre)	,,	19,279	53,444	725	4,842	5	203,443	620,565	11,526	91,391	150
Phosphate of Lime and Rock Phosphate	,,	61,742	200	2,380	—	—	148,267	565	11,888	—	—
Unenumerated	,,	11,186	2,918	2,772	773	20	66,550	27,711	35,330	12,183	1,114
Metals and Ores:											
Antimony Ore	Tons	27	—	—	—	—	340	—	—	—	—
,, Crude and Regulus	,,	149	958	275	155	76	4,312	80,190	38,707	12,460	5,812
Brass, Bronze, and Metal Bronzed or Lacquered, Manufactures of:											
Wire	,,	28	2	14	1	—	2,003	352	3,339	320	—
Unenumerated	,,	81	57	256	294	198	12,845	13,156	49,168	63,464	35,065
Copper Ore	,,	136	—	1	—	—	1,072	—	15	—	—
Iron Ore, Manganiferous	,,	—	—	—	—	—	—	—	—	—	—
,, Other Sorts	,,	7,694	15	13	—	—	7,688	68	50	—	—
Iron and Steel, Old (except old Rails)	,,	1,032	900	97	200	—	3,638	2,014	466	1,135	—
Iron and Steel, and Manufactures thereof:											
Iron, Pig Iron: Basic	,,	—	—	—	—	—	—	—	—	—	—
Lead, Ore	,,	1,088	12	508	7,505	—	9,465	180	7,634	130,150	—
,, Pig and Sheet	,,	15,096	27,780	5,847	133	—	289,100	652,216	181,572	4,714	—
Manganese Ore	,,	7,013	288	35	116	512	29,232	4,292	837	3,532	22,232
Pyrites of Iron and Copper	,,	1,293	1,595	—	—	—	1,469	1,826	—	—	—
Tin, Ore	,,	2,901	216	824	—	—	216,742	15,966	74,300	23	—
,, In Blocks, Ingots, Bars, and Slabs	,,	30,643	23,364	17,494	18,124	4,189	4,756,912	3,932,385	3,236,798	4,005,874	1,204,506
Zinc, Ore	,,	2,011	19,352	16,317	5	1	15,965	147,908	122,052	30	55
,, Crude, in Cakes	,,	3,380	958	878	629	117	83,413	52,961	67,911	40,285	6,712
,, Manufactures	,,	338	683	223	127	12	13,007	44,586	24,664	12,365	1,616
Ores, unenumerated	,,	7,281	6,516	7,460	15,711	17,375	127,219	118,836	195,375	476,571	670,380
Methylic Alcohol (not purified so as to be potable)	Gallons	190	—	20,907	1,322	6,175	25	—	5,289	424	4,396
Mica	Cwts.	19,377	6,854	18,371	24,854	27,246	116,914	57,448	151,230	238,647	343,961
Nuts and Kernels, for expressing Oil therefrom:											
Copra	Tons	24,334	75,111	12,089	1,839	98	620,784	1,948,485	367,170	59,809	3,975
Ground Nuts (or Arachide Nuts, Monkey Nuts, or Pea Nuts)*	,,	—	—	—	1,370	—	—	—	—	29,791	—
Palm Kernels	,,	9,185	24,177	29,490	22,406	—	168,689	418,202	618,132	542,177	—
Other Sorts	,,	11,721	9,289	4,072	617	1	198,901	179,155	113,187	23,761	79
Unenumerated (not being Drugs, Dye Stuffs, or Fruit)	Value	—	—	—	—	—	33,998	175,136	125,532	25,071	11,055
Oil: Mineral Jelly (including Vaseline)	Cwts.	3,435	6,723	8,248	3,619	407	8,648	17,684	23,659	16,002	3,521
Olive, Unrefined	Tuns	393	132	17	16	—	17,847	6,578	913	1,339	—
,, Refined	,,	817	728	580	451	9	63,705	50,687	48,422	38,531	1,731

*Included in "Nuts and Kernels for expressing Oil, other Sorts," prior to 1917.

EXPORTS OF ARTICLES OF FOREIGN AND COLONIAL MERCHANDISE—*continued*.

(Articles subject to Duty on Exportation are printed in *Italics* in the first column.)

ARTICLES.		QUANTITIES.					VALUE.				
		1914.	1915.	1916.	1917.	1918.	1914.	1915.	1916.	1917.	1918.
Oil—*continued* :							£	£	£	£	£
Palm, (not including Palm Kernel Oil), Unrefined	*Cwts.*	844,174	606,317	279,860	397,447	9,920	1,205,192	897,526	500,952	859,875	26,061
,, Kernel, Unrefined	,,	3,435	3,612	2,411	—	—	5,555	8,119	5,643	—	—
,, and Palm Kernel, Refined	,,	430	399	200	22	—	1,187	1,232	636	57	—
Petroleum : Crude	*Gallons*	—	—	—	—	—	—	—	—	—	—
,, Lamp Oils	,,	838,023	3,813,924	1,474,256	446,876	342,011	19,568	89,053	60,107	30,241	30,200
,, *Motor Spirit* ..	,,	347,522	4,984,983	3,298,128	3,366,379	424,471	19,474	224,883	238,902	260,025	58,368
,, Spirit, other than Motor Spirit ..	,,	—	—	—	—	—	—	—	—	—	—
,, Lubricating Oils ..	,,	1,060,222	1,823,946	913,058	1,027,786	935,067	59,093	84,228	83,539	119,393	125,040
,, Gas Oil	,,	2,110,996	2 5,639	18,650	4,615	125	27,742	4,337	625	159	12
,, Fuel Oil	,,	750,140	647,984	1,264,437	347,550	46,760	11,813	10,434	48,701	11,744	3,815
,, Other Sorts ..	,,	4,000	13,348	8,131	6,852	—	150	905	2,803	1,122	—
Seed Oil :											
Castor	*Tons*	10	33	144	36	—	428	1,277	6,270	1,944	17
Cotton-seed Oil, Unrefined ..	,,	432	69	165	60	—	13,679	2,170	5,865	2,486	—
,, ,, Refined ..	,,	1,811	9,875	818	101	—	53,766	309,866	28,291	4,029	—
Linseed Oil, Pure	,,	123	71	4	1	—	3,400	2,275	209	60	—
,, ,, Not Pure	,,	9	—	—	11	—	295	—	6	536	—
Rape-seed Oil	,,	39	205	37	43	—	1,239	6,549	1,719	2,763	—
Soya Bean Oil	,,	1,054	5,836	10,221	10,651	2,500	37,405	156,850	345,685	422,173	128,583
Other Seed Oils	,,				99	2				4,939	1,644
Turpentine	*Cwts.*	24,760	50,858	49,114	22,102	1,577	40,061	93,568	115,060	62,471	8,571
Essential :											
Natural	*Lbs.*	495,616	540,841	663,951	458,190	464,452	115,898	129,183	204,822	156,866	211,874
Artificial	,,	5,147	2,902	3,787	2,653	516	1,838	1,636	3,313	2,850	640
Unenumerated	*Value*	—	—	—	—	—	21,621	29,797	52,657	28,580	4,676
Oil-seed Cake, containing no dutiable ingredient :											
Cotton seed Cake	*Tons*	586	2,633	—	3	—	3,358	33,410	—	60	—
Linseed Cake	,,	77	121	4	10	10	649	983	76	201	160
Rape-seed Cake	,,	50	260	—	—	—	225	1,671	—	—	—
Unenumerated	,,	2,261	3,938	8	1	—	14,164	28,802	78	21	—
Oleo-margarine or Oleo Oil, and Refined Tallow	*Cwts.*	117,236	325,598	343,982	106,574	1,020	256,249	828,662	1,081,008	407,749	5,100
Painters' Colours and Pigments :											
Barytes	,,	1,378	1,546	4,265	—	—	254	517	1,376	—	—
Nickel Oxide	,,	—	2	21	405	—	—	16	180	2,500	—
Red Lead	,,	1,557	1,880	2,828	1,500	—	1,559	2,739	6,320	3,380	—
White Lead	,,	217	2,221	5,736	1,204	—	[illegible]21	3,485	10,315	2,561	—
Zinc Oxide	,,	6,236	14,772	20,578	4,789	117	8,874	31,148	66,673	15,964	509
Unenumerated	,,	38,984	24,953	48,383	18,316	1,472	22,282	39,450	106,140	59,352	10,002
Pulp of Wood :											
Chemical : Dry, Bleached ..	*Tons*	434	563	22	—	106	3,834	7,679	463	—	3,816
,, ,, Unbleached ..	,,	7,032	1,726	—	—	100	56,718	15,320	—	—	3,593
,, Wet	,,	—	—	—	—	—	—	—	—	—	—
Mechanical : Dry	,,	—	—	—	—	—	—	—	—	—	—
,, Wet	,,	82	—	—	—	—	205	—	—	—	—
Soap, not containing sweetening matter :											
Stock	*Cwts.*	11,262	245	—	—	—	15,745	287	—	—	—
Soft Soap	,,	19	54	4	28	—	30	87	6	118	—
Household and Laundry Soap in bars or tablets	,,	9,302	8,079	1,745	1,465	13	11,196	10,353	2,736	2,741	39
Polishing and Scouring Soap ..	,,	34	15	22	—	—	76	26	40	—	—
Soap Powder	,,	316	127	2	—	—	216	272	10	—	—
Toilet Soap	,,	432	814	395	143	109	2,507	4,087	2,674	809	1,197
Unenumerated (including Cotton-seed Oil Soap)	,,	197	2,446	1,411	40	—	153	2,212	2,082	87	—
Soap, Transparent, in the manufacture of which Spirit has been used	*Lbs.*	2,578	230	229	—	—	118	15	12	—	—
Sugar :											
Unrefined, Beetroot	*Cwts.*	6	—	—	—	—	11	—	—	—	—
,, Cane and other sorts	,,	159,651	6,547	65,310	12,248	4,168	86,823	29,067	70,722	19,927	7,695
Glucose, Solid	,,	402	338	666	6,003	40	249	242	687	6,907	118
,, Liquid	,,	701	2,354	4,871	1,394	358	450	1,659	5,713	2,296	793
Molasses and invert sugar :											
Containing 70 per cent. or more of sweetening matter ..	,,	567	399	34	23	106	181	267	114	74	355
Containing less than 70 per cent. and more than 50 per cent. of sweetening matter ..	,,	3,766	44,131	16,984	609	201	987	22,630	11,104	1,257	519
Containing not more than 50 per cent. of sweetening matter	,,	—	21	—	—	—	—	11	—	—	—
Saccharin and mixtures containing Saccharin or other substances of like nature or use ..	*Ozs.*	225,966	34,037	104,976	3,324	44	2,046	1,289	6,749	722	20
Talc, French Chalk, Steatite, Mineral White, Silica, and Soapstone	*Cwts.*	11,943	16,472	16,704	3,936	2,366	4,299	5,734	6,665	1,853	2,093
Tallow (including Vegetable Tallow) Unrefined	,,	823,851	536,140	157,589	105,597	5,016	1,381,483	953,318	367,583	292,927	16,472
Tar (other than Coal Tar) ..	,,	20,024	23,402	32,874	16,124	12,655	9,194	13,966	26,159	27,657	30,835

Oil and Colour Chemists

The Porosity of Oil and Varnish Films

Two papers were read at the meeting of the Oil and Colour Chemists' Association on Thursday, October 9, by Mr. A. de Waele. The first was "Some Notes on the Porosity of Oil and Varnish Films," and it recalled a paper published some eight or nine years ago on the protective agency of air drying and stoving varnishes on the interior of tinned iron vessels intended for preserved fruit or jam. The author of the latter paper—the name of whom Mr. de Waele could not recollect—experimented on various types of varnishes, including air drying and stoving, and found that considerably better protection was afforded by hard drying somewhat over-siccatised manganese varnishes, compared with the ordinary type, whilst stoving varnishes yielded by far the best results of any.

A year or two ago Mr. de Waele carried out some experiments to determine the relative porosity of various paints in respect both to their media and to their pigment to medium proportion, and found that for any given pigment the proportion of medium (spirit free) to 100 parts of pigment was inversely proportional to the porosity. When comparing different pigments he also found that intrinsic impermeability for a given proportion of pigment to medium was also influenced inversely to the specific oil absorption of the pigment, specific oil absorption being that minimum proportion of oil necessary to convert the dry pigment into an unmistakable paste. The results followed those found by previous investigators, and demonstrated that the effects noted were on physical grounds only, and ruled out the possibility of any chemical influence.

Films of paint were obtained by coating tinned iron, allowing several days for thorough drying, and then amalgamating a mercury and dilute sulphuric acid, one edge of the sheet. Amalgamation was sufficiently complete in a few hours to peel off the sheet. Varnish films were similarly obtained. Determinations of permeability were carried out by introducing into a flat-lipped CO_2 flask some strong H_2SO_4, coating round the lip with a molten mixture of shellac and resin, applying the film, trimming off and weighing when cold. The flask was then kept in an incubator in a saturated atmosphere and weighings were made every three hours. Experiments were also carried out to determine the actual nature of the "pores" in varnish films, experience having shown that while a varnish film was free from obvious imperfections, such as cracks due to age, absolute protection against rust was afforded, no matter how porous the film might appear from permeability determinations.

This rather suggested that the degree of permeability was in the nature of the film being a semi-permeable membrane. Accordingly, films were prepared in the usual way and fitted as membranes to a form of Donnan osmometer. The interior cell was filled with 5 per cent. NaCl solution, and the whole immersed in an outer vessel of distilled water to a similar height inside and outside. There was to be observed an exceedingly small rise in the inner vessel after thirty minutes or so, followed after a few hours by a slight lowering to below the original level. This latter departure from generally accepted laws Mr. de Waele did not attempt to explain; but he observed it in nearly every case. As was to be expected, the outer vessel, after an hour or so, contained a large amount of NaCl.

Discussing the behaviour of varnishes made on a tung oil basis and china wood oil varnishes, under the same conditions, having regard to the extraordinary absence of "bloom" or "chalking" on immersion of a film of tung oil varnish, the author said that no differences were apparent in the osmosis experiments between copal varnishes (both hard-drying and elastic types), and varnishes made from china wood oil quite free from tendency to "bloom." The author was not prepared to offer explanation as to the non-chalking of certain films of china wood oil on immersion. Experiments on permeability to moist air certainly showed a superior permeability in the case of non-blooming wood oil varnishes, but not to a degree warranted to explain the optical difference on immersion, and although blooming might be condemnatory in an oil varnish film, non-blooming must certainly not be taken as a criterion of suitability to withstand water. The author found little difference, contrary to the experience of many, between immersion in salt or distilled water. These experiments were carried out when Mr. de Waele was in charge of the A.I.D. paint and varnish laboratory in connection with varnishes required for the floats of seaplanes.

Discussion

Mr. A. Selby Wood said that whereas a tung oil varnish was usually considered most suitable for conditions where there was moisture and water present, it appeared from the paper that there was no difference below the permeability of a tung oil film and an ordinary varnish film.

Mr. A. Molteni, speaking with regard to rusting, said he had known cases in which rusting did not appear to be taking place whilst the film was in position, but when the film was removed, and the metal examined, corrosion pitting was often clearly visible. He could not offer an explanation of that. Another case in which he was concerned was that of a thin wood oil film, which appeared to be resistant to moisture, having been exposed in a moist atmosphere for three months without any signs of rusting. When it was removed to the laboratory, however, corrosion was very bad after two months, the wood oil apparently allowing penetration by the acid fumes of the laboratory.

Mr. W. J. Palmer thought too much attention was being given to the medium in the case of paint films, and not sufficient to the pigment. In a great many published results of exposure tests in America the pigment entered into consideration as much as the medium, and he was convinced that there was a conjoint action of the two. He was not clear, however, as to the theoretical basis to which the results could be traced.

Mr. Tyson said he was interested in polymerised linseed oil, and mentioned an instance in his works in which a coating of polymerised linseed oil, burnt umber and carbon black, applied as a protective coating to corrugated iron nine years ago, was still effective. Notwithstanding the proximity of a chemical factory, which was evolving large quantities of SO_2 night and day, a soap works, and a match factory, which evolved phosphorous fumes, the coating was as good now as when first put on.

Mr. J. G. Wilkinson, who had been carrying out permeability experiments on a small scale, asked for further information as to their manipulation, particularly with regard to the preparation of the films. Filter paper, coated with gelatine and soaked in water, had proved fairly satisfactory. Also had the author made an attempt to measure the thickness of the films?

Mr. H. H. Morgan, who presided, said this was a subject in which he had carried out a large number of experiments, but a series which were started about eighteen months ago were not yet complete, and for that reason he did not wish to say much on the subject now. If he thought the results were interesting, he would be glad to put them before the Association when they were available. The determination of the permeability of varnishes by coating wooden blocks, weighing them and immersing them in water, was a method which had often been adopted in this country, as well as in America, but it was a process which needed to be carried out with considerable care, which was not always the case, judging by certain American results which had been published. It was a method which was used by the Engineering Standards Association in its experiments when drawing up the specification for the Air Board, in connection with propeller varnishes chiefly.

Mr. de Waele, replying to Mr. Molteni on the question of rusting, said he found that tinned iron sheets gave the best information, as the tinning accelerated the rusting. On the question of the use of polymerised linseed oil, the effect referred to was due to the fact that polymerised linseed oil would outlast raw linseed oil for a long time, and it was not due to the intrinsic permeability of the film. Raw linseed oil, during the first week, would be as impermeable as polymerised linseed oil.

Cost of Ready-made Paints

The second paper described a method for calculating the cost of ready-mixed paints, but we are unable to give the full details as the author had not time to go into them thoroughly. The author has endeavoured to work out a method which will permit of calculations as to the cost of paint of a given tint in circumstances in which the preparation of actual samples is impossible. Similarly, in the attempted cheapening of certain paints by the substitution of inert films for white lead or other pigment base, some revision of formulæ is necessary in consideration of higher or lower oil absorption due to the substitution. The method aims at avoiding recourse to the roller mill or laboratory cone mill, both of which, says the author, often afford inaccurate or insufficient information, the latter on account of the obvious disparity in the pigment oil contact afforded by the small scale preparation, and the former by the losses occasioned, precluding calculation of yield in gallonage. The principal stumbling block in the calculation of paint formulæ is the amount of medium to be used to obtain a given fluidity or ease of working. The paper contains a number of formulæ which, in use for various pigments and mixtures of pigments, have been found to give the rule that paints of equal fluidity are obtained by adding an equal volume of thinness to the volume of the paste. The formulæ, however, are said to be valueless in the case of enamels and gloss paints.

There was a brief discussion on the paper, but the publication of the full details is awaited before full discussion can take place.

Review

THE CHEMISTRY OF COLLOIDS. Part I, "Kolloidchemie," by Richard Zsigmondy, translated by Ellwood B. Spear. Part II, "Industrial Colloidal Chemistry," by Ellwood B. Spear. (First Edition.) London: Chapman & Hall, Ltd. Pp. vii, 288. 13s. 6d. net.

The greater portion of this book (238 pages out of a total of 274) consists of an American translation of Zsigmondy's "Kolloidchemie," which first appeared in 1912, and is well known to all students of the subject. The first four chapters deal with the classification, general properties and theory of colloidal systems, while eight chapters are devoted to the description of individual sols and gels. These are simply divided into "Inorganic" and "Organic" colloids, a classification, which, as the author states, differs from any yet suggested. It may be respectfully doubted whether it will, or ought to be, generally followed, since it does not coincide with differences in any one of the characteristic properties of colloids as such. The treatment in these descriptive chapters is clear and adequate throughout, especially as regards the portions of the subject to which the author has made classical contributions himself. In view of these it is perhaps natural that forty pages should be devoted to metal sols, while thirty are considered adequate for all the proteins, a ratio which can hardly be thought to correspond to the relative importance of the two classes.

The description of experimental procedure is in many cases insufficiently clear to enable even an intelligent reader to repeat it successfully. Thus the prescription for dialyzers (p. 36), "25 gms. of collodion wool are covered with absolute alcohol and the volume is made up to one litre" will certainly not produce any collodion at all, if followed literally, and a very ill-defined one if the reader is sufficiently ingenious to guess that "making up" is to be done with ether. This is not an isolated instance by any means.

The translation is, on the whole, adequate, although not distinguished. The usual irritatingly literal renderings of German idioms and constructions are numerous: it is surely not necessary to write: "Under soaps we will understand the salts, &c.," or "A few examples . . . will now be taken up." "Distention" (*sic*) seems an even less desirable translation of the German "quellung" than the usual "swelling," although it must be admitted that no real equivalent exists in English. The extremely curious spelling "cathion" is used throughout instead of cation: as Prof. Max Mueller said of a similar piece of classical scholarship, it "speaks volumes."

The translator has added—possibly in deference to the feverishly utilitarian tendencies of the last few years—a Part II, entitled "Industrial Colloidal Chemistry," which, in the small space of 34 pages, attempts to deal with such heterogenous matters as the Smoke Nuisance, Rubber, Tanning, Milk, Clays and Soils, &c. The treatment is necessarily sketchy and, speaking generally, amounts to little more than re-stating things which are well known in the terminology of modern colloidal chemistry. The reviewer, while profoundly convinced of the importance and promise of the science, cannot help doubting whether such attempts at "justification by works" are necessary in the case of a branch of physical science which is barely twenty years old; nor whether the form they have usually taken in recent discussions and publications, viz., telling the manufacturer what he already knows in language which he does not understand, is likely to achieve that object.

The book is well printed and illustrated, and—much as one may disagree with its distinguished author on some fundamental questions—will have to find a place in every complete library of the subject.

E. H.

Books Received

THE CONDENSED CHEMICAL DICTIONARY. Compiled and edited by the Editorial Staff of the Chemical Engineering Catalog. The Chemical Catalog Co., Inc., New York. Pp. 525. $5.00.

WASTE-HEAT BOILERS AND PULVERISED FUEL IN CHEMICAL FACTORIES. By Captain C. J. Goodwin. Reprinted from the Journal of the Society of Chemical Industry, 1919. Pp. 31.

Training Salesmen & Buyers

To Improve the Distributive Side of Chemical Industry

Increased attention is now being given in America to the improvement of the distributive side of the chemical industry, and the following notes, though dealing with the American situation, may be of wider application.

WAR problems in the chemical industry were problems of production. Peace problems are now beginning to call for solution. The emphasis is passing from production problems to distribution problems, and there is a growing conviction on the part of directors of chemical companies that more men of chemical training are needed in the purely commercial branches of the industry. The chemical industry is the most technical of all industries. In no other industry are the processes of manufacture so multiform and so complicated, and in no other industry are the uses to which the finished products are put so various and so technical. A situation is thus created which throughout all branches of the chemical industry puts a premium upon technical training. To the industrial application of chemistry we are going to see added its commercial application. Chemical products are made by technical experts: they will be bought and sold by chemically trained men.

Detailed, intimate, expert knowledge of the goods which he sells is the most important part of the salesman's equipment. Chemical salesmen, representing manufacturers with large and varied lines, as in the dye and medicinal fields, are often called upon to do missionary work in the developing of new markets for old chemicals or the introduction of new products. If expert knowledge of his goods helps the shoe salesman and the canned goods salesman and the hardware salesman, how much more must it help the salesman of chemical products?

Before the war we had salesmen who had picked up a superficial knowledge of the uses to which their chemical goods were put by their customers, and were able to talk quite glibly in the jargon of trade chemistry. Among them were, of course, a smattering of men who had a real understanding of the chemistry of their goods, and it is worth remembering that the German dye-stuffs trust thought it well worth their while to send all over the world salesmen trained both in chemistry and in the language of the country they visited to instruct buyers in the proper application of their dye-stuffs. The American dye industry to-day suffers from the misuse that has been made of their dyes, misuse that was sometimes intentional and sometimes a necessary makeshift; but which, in many cases, must have been due to lack of technically trained men.

What holds good of the chemical salesman, and the advantage that chemical training is to him, is as true of the chemical buyer. Slight differences in grades, in percentage of various constituents, make great differences in the uses of chemicals. Misunderstandings arising out of these matters of grade and quality cause many of the suits over refused shipments of goods. The expert knowledge of chemicals in purchasing agents is a tremendous protection to the buyer, and such men are needed to-day not only in the chemical industry but in other industries which are large buyers of chemical products, such as the textile, leather, soap, paper and metal industries.

There is a real and very definite need for men of chemical technical training in the commercial side of the chemical industry, and as yet there has been no effort on the part of our schools and colleges to fill this demand. A few men who have had more or less chemistry in college have become salesmen and buyers of chemicals; but it has been a purely haphazard thing, and such a source of supply cannot begin to fill a demand that is becoming more and more insistent, the filling of which will be an important step forward in chemical development.

It is obvious that a course in commercial chemistry would appeal to men who would not be temperamentally inclined to chemistry as a science. The men needed for this work are men with the commercial instinct,—the business inclination well developed—and these men are seldom those who make either the best teachers of chemistry or research workers. But the commercial instinct is not of itself to be condemned, and courses of this kind would be attractive to many students who after a year of chemistry would normally drop out of the ken of the Chemistry Department entirely. The second thing that is plain is that these men would require only a moderate amount of training in pure chemistry. A fair medium would be two years of lectures and laboratory work.

Commercial chemistry courses should build upon a broad foundation of chemistry, a good working knowledge of chemical industrial processes and the industrial and mercantile uses to which various chemical products are put. It might well contain a series of lectures upon chemical markets—the way in which chemicals are sold, containers, shipping, sales contracts, &c. Crude drugs, essential oils, vegetable oils are closely allied products about which the student should know something. Courses on commercial chemistry, as such, should be supplemented by such commercial courses as most of the larger universities are now offering on banking and finance, applied economics, commercial law, and, in some cases, upon actual salesmanship.—*Drug & Chemical Markets.*

The Alsatian Potash Industry

An American Estimate

In a contribution to the September issue of our American contemporary, the *Chemical Engineer*, Mr. Frank K. Cameron, consulting chemist, Minerals Investigations, Bureau of Mines, U.S.A., gives some important figures regarding present and future costs of production of potash in Alsace, and discusses their effect and that of probable future output upon the world's markets. The following extracts, it will be noticed, confirm the views expressed in the article on "The International Potash Situation" which was specially contributed to The Chemical Age of July 19 last :—

It has been quite impossible to obtain accurate cost figures up to the present. The operators, while very willing to give any information quite fully, have had too limited an experience to enable them to speak with confidence and assurance. They are fully convinced that they are bringing down the cost of operations, and that within a year it will be much lower than at present, an opinion in which the writer concurs. The best that can be done at present is to formulate a more or less intelligent "guess" at approximate costs after talking with men in actual charge of the operations at the several plants. Repairs and renewals are high, both in mine and plant, and it is expected all tools and equipment in the refinery must be completely replaced within three years. From notes of rough estimates on the ground, the following figures are submitted as fair approximations of the present actual cost of putting Alsace potash at Havre, Antwerp, or Rotterdam, ready for export to America :—

1. For potassium chloride averaging 18 per cent. K_2O or better :

Operation.	Cost per ton.
Mining	$4.00
Milling	.85
Bagging	1.50
Renewals and Repairs	1.00
Office and Supervision	.75
Interest	1.00
Freight	2.00
Total	$11.10
Cost per unit of K_2O	.617

2. For potassium chloride averaging 45 per cent K_2O or better :

Operation.	Cost per ton.
Mining	$10.00
Milling	4.12
Bagging	1.50
Renewals and Repairs	4.50
Office and Supervision	1.88
Interest, etc.	3.75
Freight	3.00 (?)
Total	$28.75
Cost per unit of K_2O	.639

To these figures must be added a charge for amortisation, profit, taxes, and ocean freight. On the other hand, it is reasonable to expect some of the above figures to be modified downward with further experience and development of trained and ample working forces. The present freight rate on crude salts from the mine is 20 francs to Havre, 18 francs to Antwerp, and 16 francs to Rotterdam, but there is good prospect for early and substantial reductions, especially in the rate to Havre.

That the Alsatian mines can be put into shape to produce 15,000 tons daily and to convert all or any part into refined salts is feasible. Although exact figures for the pre-war price of establishing a mine in Alsace are not available, it appears that, on the average, the existing mines cost about $3,000,000 apiece. This would mean approximately $20,000,000 as representing the actual investment in the mines formerly held by the Germans. While no one now knows definitely what will be done with the Alsatian mines, the opinion in France seems to be that the German interests will be bought out on a valuation based on the actual investment, and then re-sold to a corporation or corporations to be formed under French control. It is expected that the new control will provide the capital to bring the present mines and their equipment to full producing capacity before any new shafts are authorised. It is estimated that at least three years' time will be required. No estimates having any authoritative backing have yet been made of the additional capital which will be required, as probable costs of material and labour are purely speculative at this time, and there is great uncertainty to what extent the refining of the crude salts should be carried out to meet the market requirements, especially the American market.

Unless the cost of production in Alsace can be materially reduced, it would therefore seem that processes for the manufacture of potash from felspars, flue, and other natural sources, and from blast furnace and cement plants, will be able to compete effectively. The crux of the whole question seems to be, however, the effect of the very favourable rate of exchange with Germany, on account of which German potash could effectually eliminate all competition provided that the German output were sufficient to meet all demands. As pointed out in our issue of July 19, this is far from being the case, and prices should therefore continue to rule high for some years, in accordance with the immutable laws of supply and demand.

A New Potash Supply

Mr. E. G. Bryant, in an article to the current issue of the *Journal of the Society of Chemical Industry* (p. 363 T), deals with the commercial development of South African saltpetre by the South African Nitrate and Potash Corporation. The following extracts are taken from the article :—

It has long been known that saltpetre (potassium nitrate) occurs on the mountains of var ous parts of South Africa. About four years ago the attention of the British Government was drawn to this possible source of potash and of nitrate ; the official sent to investigate appears to have been considerably impressed with what he saw, but his report led to no tangible result. Mr. V. Grindley Ferris, consulting engineer to the Consolidated Goldfields of South Africa, examined a portion of the district, roughly 33 miles long by six wide, and reported saltpetre in amounts from 3 to 30 per cent. on every farm visited. One sample, taken from the face of a tunnel 35 ft. in from the mouth, gave 7.7 per cent. of potassium nitrate over 5 ft. of face. Mr. W. T. Hallimond reported that the available tonnage on the farms examined was far in excess of that required to warrant the outlay on any works which might be required for the treatment of nitrates to meet the demand in South Africa, and for an unlimited export trade as well. The nitrate deposits occur in the Griquatown beds of the Transvaal geological system ; they extend from just south of the Orange River northwards to the Kalahari Desert, and then eastwards into the Transvaal from Zeerust to Pietersburg (in the Transvaal they are usually termed the Pretoria beds). Their full extent to the west and north is unknown, as they are covered by immense deposits of sand and of volcanic matter ; their thickness is from 2,000 to 3,000 ft.

A large number of assays and analyses show soluble contents usually varying from 3 to 10 per cent. The main constituent is always potassium nitrate, with smaller (often insignificant) quantities of calcium and magnesium nitrates, also a little chloride and sulphate ; the very small amount of sodium salts usually present is remarkable. Typical analyses gave :—

	1. %	2. %	3. %	4. %	5. %
Potassium nitrate ..	24.3	14.67	5.95	1.2	25.88
Calc um nitrate ..	0.30	—	—	—	—
Po assium sulphate..	—	10.77	—	—	—
Sodium nitrate ..	—	22.47	—	1.4	1.10
Sodium chloride ..	—	0.90	1.10	—	0.20
Magnesium nitrate ..	—	—	2.34	—	—

When it is remembered that these shale beds cover an area of some hundreds of square miles, that the thickness of the nitrate layers is not less than 10 ft. and often extends to two or three times that amount, and that the nitrate contents are at least 3 per cent. of the weight of the shales, the magnitude of the depos t becomes apparent. Now that it is definitely ascertained that saltpetre can be obtained from 400 ft. io, the Prieska potash supply may prove to be the largest in the world.

It is estimated that a small profit can be made from shales containing as little as 3 per cent. of nitrates, even should the price of saltpetre fall as low as £20–£25 per ton. The treatment proposed consists mainly in leaching the material broked up to a suitable size with hot water and evaporating the solution to crystallising point by solar heat, or by artificial means, or by both combined

The sum of £9,354 has been left by the late Mr. Abraham Grandage, of Kent House, Rawdon, senior partner in the firm of E. C. Williams & Co., merchants, who was concerned in the formation of the Bradford Dyers' Association.

Explosion at Cellulose Works

Believed to be Due to Copper Acetylide

THE recent explosion at the British Cellulose Works, Spondon, resulting in the death of Arthur Gill Dewdeney (38), superintendent engineer, was the subject of an inquiry before the Borough Coroner (Mr. J. Close), on Monday.

William Minion, foreman fitter at the works, stated that the accident occurred on September 23, following upon dismantling operations carried out under the instructions of Mr. Dewdeney. The plant had been washed out ready for dismantling. The column to be taken down was 27 ft. high, and in three sections bolted together by flanges. The parts were disconnected, the top one removed and the middle section taken down. He was outside when the explosion occurred, and saw nothing but smoke coming through the roof. He returned to the scene and found Mr. Walton lying at one end of the column section and Mr. Dewdeney at the other. Mr. Walton was now in the Infirmary. Witness said he had disconnected a number of such columns previously and the work had always been accomplished without any accident.

Evidence of Works Chemists

David Carmichael Stark, a chemist to the company, who was present at the time of the explosion and is himself suffering from its effects, said Mr. Dewdeney was looking down a section of the column and he was blown bodily two or three yards by the force of the explosion. Several plates in the cylinder were blown off.

By Mr. Ward (H.M. Inspector of Factories): No instructions were given about keeping the plant damp, and he did not know, as a chemist, at the time that this should have been done. They were unaware of the presence of any copper acetylide. There was a fatal accident before, and Mr. Fitch was looking for explosive matter when the accident occurred.

Arthur James Fitch, a Fellow of the Institute of Chemistry, said he went to Spondon as a chief chemist in 1917. The company had manufactured acetic acid by a synthetic process over which he took charge. The decomposer was a large vessel possessing a column 27 ft. in height and this was being dismantled for removal to another part of the premises. Mr. Dewdeney was responsible for this work, and as chief chemist witness was satisfied with the way the work was done. The decomposer was used up to the present and was then washed out, so as to clear away the fumes which would have been objectionable to the workmen. Witness was studying the cause of the previous accident and during the morning he took a sample from the inside of a small connecting pipe of an acid substance, which was slightly moist in character. He took a further sample from the column itself to test in his laboratory. The second sample consisted of a black powder, which he scraped off with a pencil. Subsequently, there was a sudden explosion and the atmosphere was coal black for a time. The black powder he had in a test tube did not ignite. The substance had been struck with a hammer since the accident, however, and had given out a flash. The fact that there were holes in the column plates did not account for the explosion. Witness said that from the tests made, copper acetylide was found in the cylinder.

Mr. Ducker (for the company): What, in your opinion, was the cause of the explosion?

Witness: The copper acetylide was the cause, I most certainly think.

At the previous explosion inquiry you could not swear as to the cause of the accident, but you had it in your mind that copper acetylide was the cause, and had been studying the subject since?—Yes.

You were surprised to find the copper acetylide there? I was. There should not have been more than the minutest trace of copper acetylide.

You see no reason to look for any other cause of the explosion?—I do not.

By Mr. Clifford: During the period of ten months minute traces of acetylene had been escaping, this being contrary to theory and what one would expect.

By Mr. Ward: The removal of the column was done as a precautionary measure, following upon the first explosion at the works. A blow from a hammer would, generally speaking, explode copper acetylide. If he had known the compound to be there in quantity, he would have kept the cylinder moist; but he did not anticipate its presence, although he was searching for it. Under the circumstances he saw no reason to moisten the parts, but he would do so in future as the result of the knowledge gained. "We know something now we did not know before," he added.

Dr. Andrew Max Soller, a chemist of long standing and experience, bore out the evidence of the last witness. He was surprised, he said, after the various processes gone through that there should have been any acetylide left in the column. He had not anticipated anything of the kind accumulating there. On the occasion of the last inquiry, when a workman was killed, they were concerned with the oxidisation stage, which was an earlier process. Following that accident steps were taken which it was thought had removed the acetylide altogether.

Mr. Ward put it to witness that the cylinder should have been moistened as search was being made for a dangerous compound; but witness pointed out that its presence was quite a surprise and all literature on copper acetylide was of a very vague nature and on the conditions when it would and would not explode. Progress was being made, but very little was definitely known on the subject at the present time.

Witness was further questioned as to the latest explosion of a minor nature on a recent Sunday, and he said that as to the cause they were not quite sure. They were using a brass vessel and the literature on the subject said brass could be used in contact with acetylene. However, as a precautionary measure, the vessels were now filled with water.

An Open Verdict

A verdict was returned to the effect that death was due to shock from the explosion, there being no clear or direct evidence to show the cause thereof. The jury added that they found no reason to blame the works' chemist, who himself ran as much risk as the man who was unfortunately killed.

The Development of Chemical Science

Professor Findlay's Inaugural Address

PROFESSOR FINDLAY, head of the Department of Systematic Chemistry in Aberdeen University, delivered his inaugural lecture to his students in the Mitchell Hall, Marischal College, on Friday, October 10.

The Principal (Sir George Adam Smith), in introducing the Professor, said they heartily welcomed him back to his Alma Mater, in which, as representing the students both on the side of study and in the constitutional part which the students played in the administration of the university, he took a very active and high place. They had rejoiced in the valuable work he had done, and in the honours he had won upon his career since he took his degree in science with special distinction in chemistry and physiology in the year 1897. His claims to the chair were founded upon the constant research which he had conducted during his career since leaving them, and from the valuable output that had resulted from it, upon his many contributions to chemical literature, and upon his long experience, both as a teacher and an organiser of laboratories. Those claims had been attested by most of the foremost authorities in chemistry in the country, including the late Sir William Ramsay. His text-book was one of the standard works upon the subject. He came to the chair with great experience as a teacher in all branches of his subject, and with the further advantage, not only to the university, but to the whole community, that he has kept in constant touch with the industries related to his science. With such a professor, possessing, as he did, such able lieutenants as Dr. Gray and Dr. Knox, they were confident that the prosperity and progress of that great department of their university would be worthy of its high traditions.

Twenty-five years of Chemical Progress

Professor Findlay, in the course of his lecture, said that during the past twenty-five years the science of chemistry had undergone a truly wonderful development, including the discovery of new gaseous elements in the air, such as argon, helium, krypton, neon, xenon. The period of these discoveries was one of the great periods in the history of British chemistry, and a period of intense interest for a young chemist to live through. The discovery by the late Sir William Ramsay of the five rare gases of the atmosphere was one of the most brilliant achievements of the greatest Scottish chemist they had ever known, and raised to a remarkable extent the prestige of British chemistry at the end of the nineteenth century. The lecturer then went on to refer to the production of X-rays, and the phenomenon of radio-activity, including the discovery of radium. These phenomena had now become built into the general structure of chemical and physical science, but they were, in the closing years of the nineteenth century, startling in their unexpectedness, and were bewildering and inexplicable until, in 1902, Sir Ernest Rutherford, at that time Professor of Physics in the M'Gill University, Montreal, and his collator, Professor Soddy, then a demonstrator in chemistry at the same university, put forward their now well-known theory of atomic disintegration. They were now beginning to

understand, imperfectly, it was true, but still more clearly than before, something of the order and unity which runs through the whole series of diverse elements known to the chemist, and they were also getting glimpses of that evolutionary process through which the material universe had passed.

They must not forget, however, that all the while a quiet but powerful stream of scientific discovery had been carrying them onward, in other directions, towards a fuller knowledge and understanding of the physical universe. Chemistry must no longer be regarded as largely a collection of preparations and an enumeration of properties of diverse substances, but as a rational science in which the isolated facts were co-ordinated and bound together into a compact and ordered body of knowledge by a number of general principles and laws. A knowledge of the laws of chemical dynamics formed the very basis of successful chemical manufacture. Professor Findlay dealt at some length with the great development in the domain of physical chemistry, including the study of the properties of solution, the study of surface tension, and the phenomena of absorption. It would be his endeavour to introduce into the course some of the more essential portions of physico-chemical theory. For the serious student of medicine or of biology there were few chapters of science more important than that which dealt with the properties of colloidal matter.

Works Chemists in Industry

Discussion at the Bristol Section

The opening meeting of the Bristol and South Wales Section of the Society of Chemical Industry was held in Bristol at the University. The membership of the Section has increased to nearly 200, practically every local industry having representative members.

The subject for the opening lecture was "Notes on Works Control," given by Mr. C. J. Waterfall, F.I.C Mr. Waterfall alluded briefly to the part played by the chemist during the past five years, and pointed out that in 1914 our position was such that even the blue dye for the navy and the khaki dye for the army were provided in Germany. Now, however, we have the foundations of a great colour industry laid in this country.

At the annual meeting of the Society the note struck repeatedly was that the efforts of the last few years needed not only to be sustained, but increased. In the colour industry we had not only to compete against the splendidly organised works of Central Europe, but also with the accumulated technical knowledge of the past fifty-three years and the data in the chemist's notebook acquired by strenuous research, which data, although possibly not of immediate commercial value, might become at any moment of inestimable worth. Part, at any rate, of our bad position was attributed to our very imperfect system of education, due to the shortsighted policy of those in charge of the matter.

The position of the chemist in the works was compared with that of the engineer, and the claim made for the full recognition of the chemist in the council of the works management. Reference was made to a criticism at a Rotary dinner in Bristol that the chemist was not helping the general manufacturer as much as he ought to do. The speaker pointed out certain broad lines in which the chemist is helping the manufacturing works in general, and could help more were he permitted. He instanced fuel, water supply, and lubrication, and pleaded for the still more scientific control of fuel consumption, expressing the opinion that the subject of combustion must come under the purview of the chemical engineer. Emphasis was laid upon the importance and difficulties of sampling materials, coal being used as an example. The subject of waste was dealt with, and a constant watch was recommended in all effluents and gases up the stack. Instances were given of economies accomplished by thus examining effluents.

A Model Balance-sheet

It was suggested that a works should have a sort of balance-sheet constructed from the chemist point of view. The loss up the stack or the liquid effluent would be taken into account together with that mysterious waste that so often occurs in works management. The difference between the weight of goods in and the weight of goods out would be checked, and discrepancies noted, and, if possible, accounted for. The comparison of costs between different works and the progress in economy production brought about thereby was touched upon, also the good effects of manufacturers meeting together in their trade organisations, and the lessening of trade jealousy in the West of England, indeed, generally.

Mr. Walls (chairman) pointed out that in the effort for increased output too much attention was directed to increasing the output of labour, and not enough to scientific and mechanical means of increase; in many processes the increase of effort on the part of the individual labourer would have only a slight effect on the yield of the process, whereas the application of technical science might result in an improvement of method resulting in great yield advantage. Each stage of manufacture should be scientifically controlled and balanced. The standards and controls insisted on by the Ministry of Munitions had in some works carried processes forward in one year more than in the previous fifty years.

Dr. Butler pointed out that the Germans had absolute chemical control in their works, and did not seem to care how much they spent in obtaining it—no matter what the control costs, it was evidently a paying proposition in the end.

Chemical Industry Club

Committee's Report for the Past Year

The annual meeting of the Chemical Industry Club has been fixed for Monday evening next, at 7.30 p.m., in the smoking-room of the Club's premises. In addition to the usual business, the members will be asked to consider the advisability of electing a president of the Club and a proposal that the number of members of the Committee shall be fifteen.

The annual report of the Committee, to be presented at the meeting, states that the premises now occupied were taken over by the Club on September 1, 1918. Previously the Club had only existed as an organisation for providing informal monthly gatherings of its members. Of the 500 members who were registered as members before September, 1918, only 120 availed themselves of the opportunity afforded them of joining the new Club. Since September, 1918, the membership has steadily increased, and the total number on the register was 633, this being reduced by the regrettable death of several members and a few resignations to 614. In other words, 513 new members have joined during the year. Of the above members, 460 became guarantors, so that the reserve fund upon which the Club can rely amounts to £2,300. The Committee are glad to be able to report, however, that although there is a small adverse balance, as this was due to some unusual and non-recurring expenses, it is not proposed to make any call upon the guarantors at present. With the steadily increasing popularity of the Club, and with a rising membership, the Committee confidently anticipate a second year during which the adverse balance referred to will be converted into a credit balance.

At first, the Committee state, the objects of the Club were not thoroughly understood, but during the year its usefulness has been recognised. Many prominent chemists and manufacturers have joined, and the Club has had an opportunity of doing useful work in connection with the recent annual meeting of the Society of Chemical Industry. The reciprocal arrangements made with the Chemists' Club of New York have brought to the Club interesting visitors from America, and this interchange of facilities is perhaps one of the most useful arrangements made during the year. The activities of the Committee have been mainly connected with internal matters and with a series of monthly meetings, which have always been well attended and interesting. The Club has granted temporary honorary membership to a number of demobilised service men connected with the chemical trade, and received the thanks of the Army Council for these facilities.

The premises at Whitehall Court are capable of providing suitable facilities for at least 1,000 members, but when that number has been reached the Committee believe that the need of a Club such as this as a part of the general organisation of British chemical industry will be so well proved that a strong move will be made to establish the Club in premises large enough to provide increased comforts for a much larger membership. The Chemists' Club of New York has a membership of 1,600, has excellent premises of its own, and is the centre of most of the chemical activities of America. The ambition of the Committee is that the British Club should fulfil a similar function here.

The Committee, in conclusion, congratulate the members and themselves on a very successful first year, full of promise for the future, and in doing so thank all the members who have helped forward the work.

From Week to Week

Mr. Edward Bomer has been elected Master of the Glass-sellers' Company.

Plans have been passed for a five-storey mill for Courtaulds, Ltd., Braintree.

Swansea Harbour returns for September show an increase in imports of sulphur ore of 5,467 tons.

The late Mr. J. G. F. Crompton, of Flower Lilies, Windley, Derbyshire, a director of the Stanton Ironworks Co., Ltd., has left estate valued at £457,160 (net personalty £447,292).

Mr. Cecil R. Harry, of Neath, who recently passed the qualifying examination of the Pharmaceutical Society, has been appointed chemistry demonstrator at the London College.

On Monday a fire broke out in the laboratory of Harland & Wolff's, Queen's Island Shipyard, Belfast. The fire was confined to the laboratory, which was completely burned out.

Priestley Scholarships in Chemistry at Birmingham University have been awarded to Francis E. Clews, William F. Andrews, and Archibald H. Goddard.

Dr. Martin Onslow Forster, F.R.S., has been elected Prime Warden, and Mr. Edward Holdroyde Haywood Renter Warden, of the Dyers' Company.

H.M. Commercial Secretary at Bucarest states that a large quantity of petroleum has already been sold to Canada, and that further quantities are ready for delivery.

As a sign of the resumption of the Belgian dye industry, dye-works at Roulers, closed by reason of the war, have just been re-started.

Mr. Edward Goodwillie, of Elgin, has been appointed chief chemist to the Solway Process Co., Detroit—one of the largest chemical establishments in America.

The Dewsbury Corporation has approved plans for additions to the dyehouse at Calder Wharf Mills, Ravensthorpe, belonging to Messrs. J. Smith & Sons.

At the annual congress of the Royal Institute of Public Health, to be held at Brussels next year, one of the sections will be devoted to bacteriology and chemistry.

Contrary to expectations, numerous Scottish oil works, which closed down recently on the threat of 9,000 men to strike for more wages, are to be re-started at an early date. It was feared months would elapse before a re-start.

Mr. Albert Vickers, of Vickers House, Broadway, Westminster, London, formerly chairman of Vickers, Ltd., and a member or associate of several technical institutions, has left estate valued at £886,584 (net personalty £759,747).

A dispute which has existed at the Elton Cop Dyeing Co.'s Works, Bury, for some time has been settled for a period of three months as a result of a conference of representatives of the firm and the operatives' associations.

The late Mr. Adrian John Brown, of Northfield, Birmingham, since 1899 the chief authority at Birmingham University on the chemistry of brewing, and chemist to Thomas Salt & Co., Burton-on-Trent, has left estate valued at £4,050.

The Department of Applied Chemistry, Manchester College of Technology, has arranged a course of twenty lectures on chemical engineering. These lectures will be delivered on Tuesday afternoons during the Michaelmas and Lent Terms.

Six hundred and fifty gallon tins of petrol were destroyed by fire last week at the Anglo-American Oil Co.'s store at Bishop Auckland. Fortunately the wind was in the right direction, or the storage tanks would have been involved.

The flow of oil at Hardstoft Well, Chesterfield, is reported to have increased to over 2,000 gallons per twenty-four hours. Oil has not yet been reached at other Derbyshire wells, drilling having been temporarily suspended.

The annual meeting of the Manchester Geological and Mining Society was held on Tuesday at the headquarters of the Society in John Dalton Street. Mr. A. J. A. Orchard, the president, occupied the chair. The retiring officers were re-elected without exception.

Dr. F. W. Skirrow, for the past four years assistant professor of chemistry at McGill University, Montreal, has resigned this position to take up the duties of chief chemist to the Shawinigan Laboratories, Ltd., the newly founded research organisation of the Shawinigan Water and Power Co., Shawinigan Falls, Quebec.

A Belgian Ministerial Decree of September 17 provides that the following articles, among others, may provisionally be exported without the requirement of import licences:—Colours, glycerine, gums, lime, olein, phosphates, resins, spirits of turpentine, varnish, and window glass, ordinary and special.

The Board of Trade announce that Sir Evan Jones, M.P., who consented to accept the position of Controller of Coal Mines for a limited period at the urgent request of the President of the Board of Trade, has found it necessary to resign the position as from October 8.

Messrs. Brunner, Mond & Co. announce that Captain Duncan Marsh has been appointed as the company's secretary, in succession to Mr. J. H. Gold, who was recently made a director. Before joining the Army, Captain Marsh was a solicitor, and during the past few months he has been acting secretary to the company.

A circular to the shareholders of the New Grosny Oilfields states that, with regard to the petroleum industry in Algeria, a good deal of prospecting work has been done in the neighbourhood of the oil deposits, several wells having been drilled successfully into the oil-bearing strata.

The U.S. War Trade Board has sent out a questionnaire to all users of dyes asking their needs with respect to German vat dyes. It is stated in the letter that a six months' supply for the period from October 1 to April 1 will be imported. Users of dyes are requested to state their needs specifically, with the understanding that none of the dyes allotted to them will be resold.

The explosion on Friday, October 10, of a still at the works of Messrs. L. B. Holliday & Co., Ltd., dye makers, Deighton, Huddersfield, caused the death of one workman and injury to another. The two men, Isaac Brown, of Midland Street, Hill-house, and Joseph William Cheeseman, of Colne Bridge, were testing the still, when the explosion occurred. Brown died almost immediately, but Cheeseman was not seriously injured.

The following particulars are published of the stocks (exclusive of old metal and scrap) in this country in possession of the Minister of Munitions on October 1, 1919:—Copper, 22,784 tons; spelter (G.O.B.), 19,046 tons; spelter (refined), 10,759 tons; aluminium, 10,004 tons; soft pig lead, 73,560 tons; nickel, 1,966 tons; antimony regulus, 3,300 tons. A proportion of the above stocks is already sold to the trade for forward delivery.

It is reported that arrangements have been completed with the Polish Government whereby Mr. Charles Perkins, managing director of the Premier Oil and Pipe Line Co., Ltd., has appointed two persons, in conjunction with one nominated by the Polish Government, as sequesters to administer the company's properties in Galicia, and that the company's offices in Cracow, Drohobzco, and Stanislau have been notified to this effect.

An arbitration took place at Old Palace Yard, Westminster, on Monday, on a claim by the Amalgamated Society of Pharmacists, Drug and Chemical Workers for a general increase of wages, based on various rates according to grade, skill, and ability, for men and women employed in the drug and fine chemical manufacturing trades. An application was also made for a reduction of working hours. The Court reserved its award.

According to a report published by the Standard Statistics Co., Washington, Messrs. J. Leonard Replogle (former Director of Steel Supplies) and Charles M. Schwab have bought the mines in Peru and the mills in Pittsburg of the American Vanadium Co. This deal involves the control of about 98 per cent. of the vanadium supply of the world. The company, it is stated, will probably be known as the Vanadium Co. of America.

The Committee appointed by the Board of Trade to consider and report upon non-ferrous mining in the United Kingdom held its first meeting after the recess on October 13, under the chairmanship of Mr. H. B. Betterton, M.P. It has decided to deal in the first instance with tin-mining, and will proceed forthwith to take evidence. Subsequently, the Committee will take up the question of zinc and lead-mining.

Monsieur Beaumont, who has been associated with the Société de Chimie Industrielle in an honorary capacity, has just succeeded Monsieur A. Rieder, who has returned to Alsace to attend to business affairs which he was obliged to abandon on account of the war. Monsieur Rieder will be remembered by the Société, not only for his excellent work, but for his loyalty to his colleagues, his integrity of character, and his kindly disposition.

The British Association has addressed a resolution to the Prime Minister and the Treasury urging on the Government the

necessity for apportioning an adequate sum from that allocated to home administration and the upkeep of the fighting forces for the purpose of a definitely organised scheme of research, as, for example, on problems connected with explosives, chemical warfare, &c.

AT A MEETING OF THE DERWENT (CUMBERLAND) FISHERY BOARD on Monday, it was stated that the Nitrogen Products Co., who proposed to establish extensive works at Workington and take water from the river Derwent, were not proceeding with the works owing to being unable to get a guaranteed coal supply. Mr. F. Hall (Mayor of Workington) read a letter, which stated that the company were not prepared to commit themselves to any expenditure till a thousand tons of coal per shift, equal to 2,000 tons per day, were guaranteed.

MESSRS. BRUNNER, MOND & CO. made an application last week to the Controller of Patents for a licence in respect of two German patents owned by the Badische Anilin and Soda Fabrik for the manufacture of ammonia. It was stated that the manufacture of ammonia was very necessary for explosives, and also in peace time for fertilisers, and that the applicants were prepared to spend half a million on experimental plant for working these patents. The Court intimated that the grant of these licences would be recommended.

A FATAL ACCIDENT occurred at the works of the New Era Concrete Construction Co., Smithies, near Barnsley, on Saturday. Arthur McCoubrey (38), engineer, of Wakefield Road, and John Waterhouse (30), labourer, of Old Mill Lane, were moving a concrete mixing machine by the aid of rope pulleys. One rope was fastened round a pillar of concrete block, about 12 feet high and 18 inches square, and during the operations the column broke, the material falling upon the men. Waterhouse died on the way to hospital, and McCoubrey later in the day.

AT A MEETING of Lewis workmen, held in the Masonic Hall, Stornoway, on Saturday, a resolution was passed expressing unqualified support of Lord Leverhulme's development scheme for the island, and appealing to the small minority of their fellow islesmen who had taken up an attitude of obstruction to desist, in the best interests of the island as a whole. A large meeting was also held at North Tolsta, at which it was agreed to write to Lord Leverhulme informing him that they now acquiesce in his schemes for the development of Lewis.

A BILL DESIGNED TO PROMOTE the production and manufacture of talc in the United States has just been introduced in the House of Representatives. The measure provides for an import tax of ½ cent per lb. on talc, steatite, soapstone, and French chalk, crude and unground; 1 cent per lb. on talc, steatite, soapstone, and French chalk, ground, washed, powdered, or pulverised; 2 cents per lb. on those commodities when cut or sawed, or in the form of blanks, crayons, or cubes, and 50 per cent. ad valorem on manufactures of talc, talcum, steatite, soapstone, and French chalk, wholly or partly manufactured, if not decorated; if decorated, 60 per cent. ad valorem.

IN ITS CURRENT ISSUE, *Nature* draws attention to what it describes as "a useful series of articles on the mechanical handling of chemical materials, by Mr. G. F. Zimmer, which have recently appeared in THE CHEMICAL AGE." "It has been remarked," it says, "that chemical works in this country are rather poorly equipped with labour-saving machinery. In present circumstances, when the cost of manual labour has increased so greatly, it may be necessary to pay more attention than formerly to devices which will reduce this cost. The articles in question will help to show how this may be done. They are illustrated, and well worth consulting by chemists in charge of factories."

IN THE REPORT of the Commission appointed by the Minister of Munitions to report on the steel works districts of Lorraine and the Saar Valley it is stated that there was undoubtedly a great shortage of manganese during the later period of the war, and its allocation to the different steel works, and for specific purposes, was in the hands of a Commission specially appointed by Germany. As a substitute calcium carbide was tried, in conjunction with reduced quantities of manganese, and used for some time. This gave very bad results, and about 30 per cent. of the steel so produced was scrap. At only one works (Volklingen) was it stated by the management that calcium carbide had been used at all satisfactorily. Powdered anthracite was tried for deoxidising purposes in the same way as calcium carbide, but was not a success.

WITH THE ASSISTANCE AND SUPPORT of the Government Department of Industrial and Scientific Research, a British Empire Sugar Research Association has now been formed, whose memorandum and articles of association and prospectus have received the approval of that department, as well as that of the Board of Trade. On May 30 this association was registered under the presidency of Sir George Beilby, who is a member of the Advisory Council of the Government Department of Industrial and Scientific Research. The vice-presidents are: Lord Bledisloe, Sir Daniel Morris, Sir Edward Rosling, Professor E. J. Russell, Professor W. Bateson, Professor J. Bretland Farmer, and Mr. Edward Saunders. The scope of the work to be done by the association will include the investigation of problems arising in all branches of the sugar industry, including the improvement of the sugar cane, sugar beet, the various methods of extracting the sweetening matter from cane and beet, the various processes of refining, and the best methods for the use of sugar employed by manufacturers using sugar as one of their raw materials, as well as the discovery of the best uses of the after-products of both factory and refinery.

Obituary

MR. R. CROZIER.—Mr. Robert Crozier, whose death has taken place at the age of seventy-four years, went to Lytham over fifty years ago as assistant to the late Mr. George Thistleton, chemist and druggist, whom he succeeded in the business, with which he was associated with his eldest son.

MR. SAMUEL JEFFERSON.—Mr. Samuel Jefferson, who has died at Harrogate, in his eightieth year, was the founder, in 1868, of classes in chemistry, for schoolmasters, in Leeds, from which, it is claimed, sprang the Yorkshire College. Mr. Jefferson was born and educated in Leeds. Taking up the study of chemistry, he won the gold medal of the Chemical Society in 1868, and was made a Fellow of the Society. He became a professor of natural science at the chief schools and colleges in Yorkshire, and was well known as a lecturer and an author on scientific subjects.

MR. W B. PULLAR.—The death is announced of Mr. William B. Pullar at Bridge of Allan, aged seventy-six, who, until recently, was a director of Robert Pullar & Sons, Ltd., dyers.

MR. J. C. UMNEY.—The death occurred on Thursday, October 9, at Berea Court, Yapton, Arundel, of Mr. John Charles Umney, F.C.S., a leading authority on drugs, medicinal chemicals, and essential oils. Mr. Umney, who was born in 1868, had for many years taken a leading part in the standardisation of these articles, and was largely responsible for the standards for medicines laid down by the Local Government Board, Ireland. He was a member of the Pharmaceutical Committee of Reference for the British Pharmacopœia. He was founder and editor of the *Perfumery and Essential Oil Record*, through which journal he stimulated aromatic plant cultivation and oil distilling in many parts of the world. His numerous publications included "Essential Oils in Relation to the British Pharmacopœia and Trade." He was a past president of the British Pharmaceutical Conference and of the Wholesale Drug Club. He had done valuable service as chairman of the Chemical Trade Section and the Toilet Soap Section of the London Chamber of Commerce. He had also been chairman of the Proprietary Articles Section of the Chamber and chairman of the Proprietary Articles Trade Association. In 1912 he gave important evidence before the Select Committee of the House of Commons on Patent and Proprietary Medicines.

Nitrate of Lime

THE production of nitrate of lime in a granular, dust-free condition must be regarded as an important advance in connection with the manufacture and practical use of synthetic nitrate for fertilising purposes. The proportion of dust, which the material contained in pre-war days, accentuated its natural tendency to attract moisture and become wet and sticky during the operation of sowing, especially in a damp atmosphere. The new granulated product, being free from dust, is consequently less active in absorbing moisture, and will remain in a dry, friable, and satisfactorily sowable condition for a reasonably long time in dry weather.

References to Current Literature

Only articles of general as distinct from specialised interest are included and given in alphabetical order under each geographical subdivision. By publishing this digest within two or three days of publication or receipt we hope to save our readers time and trouble; in return we invite their suggestions and criticisms. The original journals may be consulted at the Patent Office or Chemical Society's libraries. A list of journals and standard abbreviations used will be published at suitable intervals.

British

ALLOYS. Notes on some chemically reactive alloys. E. A. Ashcroft. *Trans. Faraday Soc.*, July, 264-270. Alloys of magnesium with zinc and with lead are described, which have the property of rapidly removing oxygen from gases.

BEARING METAL.—Observations on a typical bearing metal. H. E. Fry and W. Rosenhain. *Inst. Metals*, September (advance copy), 7 pp. Results of microscopical and physical tests of the metal are detailed.

CARBONISATION. Low temperature carbonisation. R. M'Laurin. *Gas J.*, October 14, 80-83. The author describes his process in a paper to the Scottish Junior Gas Association.

ELECTRIC FURNACES. A high-temperature electric resistance furnace. W. Rosenhain and E. A. Coad-Pryor. *Trans. Faraday Soc.*, July, 264-270.

GAS. Post-war problems. C. E. Wright. *Gas J.*, October 7, 24-26. Some present day problems and difficulties are discussed.

Water-gas and coal conservation. S. Moore. *Gas J.*, October 7, 22-24. Some of the advantages of water-gas are enumerated.

METALS. Moulding sands for non-ferrous foundry work. P. G. H. Boswell. *Inst. Metals*, September (advance copy), 22 pp. The composition, properties and occurrences of British moulding sands are dealt with.

The solidification of metals from the liquid state. C. H. Desch. *Inst. Metals*, September (advance copy), 23 pp. Second report to the Beilby Prize Committee.

Season cracking. W. H. Hatfield and G. L. Thirkell. *Inst. Metals*, September (advance copy), 25 pp. An investigation of the cracking of metals with age has been made.

The occlusion of gases by metals. *Trans. Faraday Soc.*, July, 193-263. Report of a general discussion on the subject, with papers by R. Hadfield, A. W. Porter, C. Johns, J. W. McBain, A. McCance, T. Baker, and J. H. Andrews.

PHOSPHATES. Coral island phosphates in the making. F. D. Power. *Bull. Inst. Min. Met.*, October, 10 pp. An interesting account of the formation and working of phosphate beds on the Pacific coral islands.

SILVER. The properties of standard or sterling silver, with notes on its manufacture. E. A. Smith and H. Turner. *Inst. Metals*, September (advance copy), 43 pp. A valuable monograph on the subject, also containing useful notes on other silver-copper alloys.

French

ALUMINIUM. Heat treatment of aluminium alloys. Grard. *Comptes rend.*, September 29, 571-574. Experiments are described with aluminium alloys containing 3.5—4.0 per cent. Cu, 0.5 per cent. Mg, and 0.5—1.0 per cent. Mn.

American

AMERICAN CHEMICAL SOCIETY. Philadelphia meeting of the American Chemical Society. *Chem. and Met. Eng.*, September 15, 278-293. A report of the meeting on September 2 is given, with abstracts of some of the papers read.

BERYLLIUM. Glucinum. J. S. Negru. *Chem. and Met. Eng.*, September 15, 353-359. The occurrence and metallurgical treatment of beryllium ores and the properties and uses of the metal and its compounds are described.

CALCULATIONS. Calculation of hydrometer degrees, gravities, and weights with the slide rule. W. Savage. *Chem. and Met. Eng.*, September 15, 395-397.

ELECTRIC FURNACES. The commercial testing of metallurgical electric furnaces. H. M. St. John. *Chem. and Met. Eng.*, September 15, 377-392. A full summary of the various methods of testing and their application is presented.

EXHIBITION. The Fifth National Exposition of Chemical Industries. *Chem. and Met. Eng.*, September 15, 294-307. The programme of the Exhibition and lists of papers to be read and of exhibitors is given.

INDUSTRIES. Natural and industrial resources of the North Central States. *Chem. and Met. Eng.*, September 15, 308-347. A series of articles covering the natural resources and chemical, metallurgical, and allied industries of Illinois, Indiana, Michigan and Wisconsin.

RESEARCH. Research and application. W. H. Nichols. *Chem. and Met. Eng.*, September 15, 278-284. Presidential address to the American Chemical Society, September 4.

SILVER. Application of the Cottrell process to the recovery of fume from silver refining operations. W. G. Smith and A. A. Heimrod. *Chem. and Met. Eng.*, September 15, 360-363. The plant of the U.S. Metals Refining Co., at Chrome, N.J., is described.

WULFENITE. Notes on the metallurgy of wulfenite. J. P. Bonardi. *Chem. and Met. Eng.*, September 15, 364-369. The sources and metallurgical treatment of wulfenite ores are described.

ZINC. Bibliography on the roasting, leaching, smelting, and electro-metallurgy of zinc. *Bull. School of Mines and Met., Univ. of Missouri*, Vol. 4, No. 3, 386 pp. This Bulletin, though dated February, 1918, has been revised to June, 1919, and contains an exhaustive bibliography, with abstracts of patents on the subject.

German

FUEL. Fuel Economy. P. Fischer. *J. Gasbeleucht*, September 13, 525-526. Suggestions for methods of economising the use of coal are made.

GAS. Tests with vertical retorts of the Dessau type. K. Bunte. *J. Gasbeleucht*, September 6 and 13, 513-519, 526-530. A number of results from different plants are quoted.

PITCH. Carbonisation of coal-tar pitch. A. Fischer. *J. Gasbeleucht*, September 6, 510-513. The results of a series of experiments are recorded.

Miscellaneous

STEEL. Some physical constants of tungsten steels. K. Honda and T. Matsushita. *Sci. Rep. Tohoku Imp. Univ.*, August, 89-98. The thermal and electric conductivities, elasticity and rigidity, and thermal expansion of steels containing up to to 25 per cent. W. have been determined.

The influence of manganese on the physical properties of carbon steels. T. Matsushita. *Sci. Rep. Tohoku Imp. Univ.*, August, 78-88. Tests have been made with steels containing 0.2 per cent. C., with the addition of up to 10 per cent. of manganese.

Welsh College of Pharmacy

THE WELSH COLLEGE OF PHARMACY, the only institution of its kind in the Principality, was opened at Cardiff on Wednesday, October 8, by the Lord Mayor (Mr. A. C. Kirk). The inaugural address was delivered by Sir William Glyn-Jones, secretary and registrar of the Pharmaceutical Society of Great Britain, who said he was glad to have the opportunity of delivering the inaugural address because he was a Welsh pharmacist who was apprenticed at Aberdare. He was the first Welsh secretary and registrar of the Pharmaceutical Society, and this was the first Welsh College of Pharmacy. They could not over-estimate the importance of science to art and industry. He was proud to know that of the 900 scholarships allocated by the Government, Cardiff would have its share. Each student would cost £110 for the nine months' course, and it was money well spent. The traditions of the new college rested with what the first students could give it, and next July, as registrar, he would look to see the results of their work.

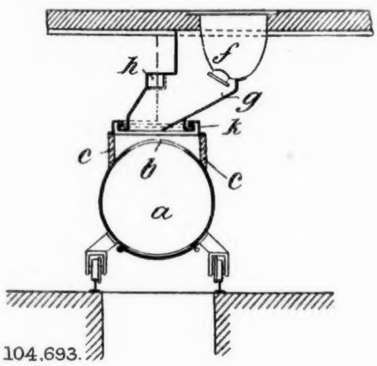
Patent Literature

We publish each week a list of selected complete specifications accepted as and when they are actually printed and on sale. In addition, we give abstracts within a week of the specifications being obtainable. Readers can thus decide what specifications are of sufficient interest to warrant purchase, the only way of obtaining complete information. A list of International Convention specifications open to inspection before acceptance is added, and abstracts are given as soon as possible.

Abstracts of Complete Specifications

104,693. SUPERPHOSPHATES, APPARATUS FOR THE PREPARATION OF. Chemische Fabrik Milch Aktien-Gesellschaft and O. Rabenau, 4, Königsplatz, Posen, Germany. International Convention date (Germany), February 17, 1916.

The cylindrical reaction vessel *a* is provided with a longitudinal slot *b* extending the full length, and a gas-tight frame *c* is fitted over the slot. A superposed frame *k* is provided with one edge turned over so as to form a liquid seal with the lower edge of



104.693.

the hood *g*. The mixing vessel *f* for the material is built into the hood *g*, and the hood is provided with a conduit *h* leading to a suction device. Any air passing into the hood as a result of the suction must pass through the mixing vessel *f*, and the gases evolved during the reaction of the phosphate with sulphuric acid and during the slow setting of the superphosphate are drawn through the conduit *h*.

107,585. ACETALDEHYDE, MANUFACTURE OF. Deutsche Gold and Silber-Scheideanstalt vormals Roessler, 7–9, Weissfrauenstrasse, Frankfurt, a/M, Germany. International Convention date (Germany), June 16, 1916.

In the manufacture of acetaldehyde by the reaction of acetylene and steam in contact with metallic oxides such as those of aluminium, zinc, iron, or nickel, it is found that the catalyst is very sensitive to poisoning by phosphorus compounds. A mixture of 15 vols. of acetylene freed from phosphoretted hydrogen and 400 vols. of steam is passed through a pipe heated to about 600° C. and containing a catalyst produced by mixing 35 parts of molybdic acid with 65 parts of asbestos, the mixture being free from phosphorus.

107,585. ACETALDEHYDE, MANUFACTURE OF. Deutsche Gold and Silber-Scheideanstalt vormals Roessler, 7–9, Weissfrauenstrasse, Frankfurt a/M, Germany. International Convention date (Germany), June 17, 1916.

In the process for manufacturing acetaldehyde as described in the preceding abstract, the catalyst may be regenerated by heating it to a high temperature in a current of air, whereby any deposit of carbon is burned off and any of the oxide which has been reduced is re-oxidised.

119,659. BISMUTH COMPOUNDS AND METALLIC BISMUTH FREE FROM ARSENIC, MANUFACTURE OF. N. Busvold, Holmestrand, Norway. International Convention date (Norway), October 3, 1917.

The process is based on the fact that sulphides of arsenic or other metals usually present in the bismuth ore are less soluble in acids than bismuth sulphide. A small quantity of impure bismuth salt solution is treated with sulphuretted hydrogen till complete precipitation is effected. The resulting bismuth sulphide is then added to a further quantity of the impure salt solution, when it reacts with the arsenic chloride and precipitates the whole of the arsenic as sulphide. The mixture is filtered, and the pure bismuth salt treated with zinc to precipitate metallic bismuth, or the metal may be recovered by any other means. Alternatively, the ore is dissolved in acid, and then a smaller quantitiy of ore or another sulphide is added in excess to precipitate the arsenic as sulphide. The same result is obtained by initially treating a slight excess of ore with acid. All the arsenic sulphide remains undissolved.

132,283. CELLULOSE ACETATE, MANUFACTURE OF COMPOSITIONS, PREPARATIONS OR ARTICLES HAVING A BASIS OF. H. Dreyfus, 8, Waterloo Place, London, S.W.1. Application date, April 29, 1918.

In the manufacture of non-inflammable celluloid or other substance with a basis of cellulose acetate, a solvent having a boiling point above 300° C., and which is also liquid at ordinary temperatures is used. Mixtures of isomeric xylene-monomethyl sulphonamides or xylene-monoethyl sulphonamides, with or without triphenylphosphate or tricresylphosphate are suitable.

132,291. CENTRIFUGAL SEPARATORS. R. S. Brownlow, The Abbey Hey Pottery Works, Gorton, Manchester. Application date, June 11, 1918.

The centrifugal separator is of the kind in which the solid matter is deposited on the inside of a vertical rotating drum. An annular or plain disc or piston rests on the bottom of the drum, and is connected by vertical rods to another annular disc which normally rests on the upper edge of the drum. Another annular disc is arranged outside the drum, and just below the outwardly projecting rim of the disc which rests on the rim of the drum. When it is desired to discharge the solid material the outer disc is raised, carrying with it the other two connected discs. The solid matter is thereby lifted out and discharged radially by centrifugal force.

132,298. AROMATIC HYDROCARBONS OTHER THAN BENZENE, PROCESS FOR THE CONTINUOUS SULPHONATION OF. E. Barbet & Fils & Cie., 5, Rue de l'Echelle, Paris. International Convention date (France), June 26, 1917. Addition to 127,614, May 1, 1916.

Specification 127,614 describes a continuous process for the sulphonation of benzene by vaporising it and treating it with hot fuming sulphuric acid. It is now found that the process is applicable to other aromatic hydrocarbons, particularly naphthalene.

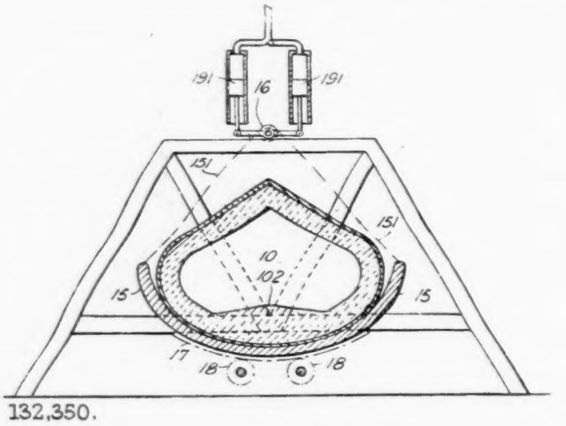
132,337. HYDROCARBONS, METHOD OF DISTILLING—OR CONVERTING THEM INTO PRODUCTS OF LOWER BOILING POINTS. L. Clark, 646, South Madison Avenue, Pasadena, Cal., U.S.A. Application date, September 9, 1918.

Oil or gas is injected into a combustion chamber, and burned under pressure with a controlled supply of air supplied through a valved pipe, the outlet of which surrounds the fuel pipe. The combustion products pass out by a straight pipe of comparatively small diameter, at a pre-determined velocity, and the oil to be treated is introduced into this pipe in a direction at right angles to the flow of hot gas. The oil and products of cracking are carried on by the current of hot gas. The nature and temperature of the combustion gases and products may be modified by passing also steam, oil, gas, &c., into the straight pipe

132,350. KILNS OR FURNACES. W. L. H. Roberts, Holborough Court, Rochester. Application date, September 11, 1918.

Relates to kilns, roasting chambers, and other furnaces which may be used in place of those of the rotary type. The furnace 10

has a convex base 102, and is supported by a cradle 15, which is suspended by chains 151 passing over sprockets 16. The cradle 15 carries a rack 17, which meshes with broken gear wheels 18, so that the furnace may be oscillated by the rotation of the gear



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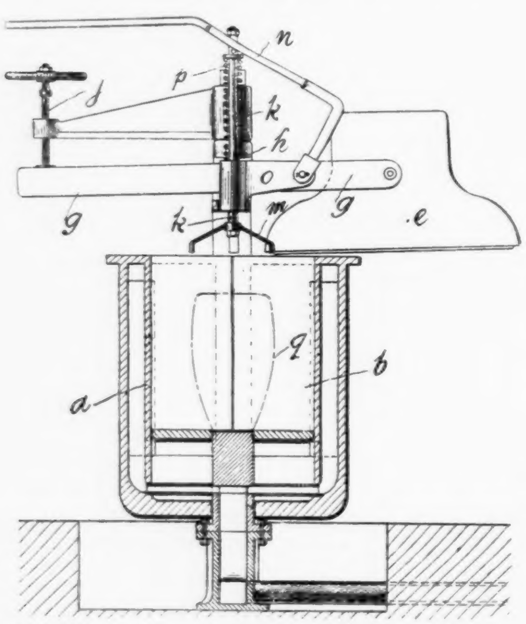
wheels in opposite directions. When the oscillation is started, the gear wheels are taken out of engagement, and the oscillation is continued by a pair of reciprocating pistons 191, which are actuated by fluid pressure. Alternatively the oscillation may be effected by a pair of solenoids.

132,381. CRUCIBLE FURNACE. W. H. Williams, Aston Chain and Hook Co., Ltd., Bromford Lane, Erdington, Birmingham. Application date, October 15, 1918.

The furnace body is in two vertical halves *a*, *b*, hinged on a vertical pillar at the side. The top *e* is carried by a lever *g*, which is pivoted on the sleeve *h*, which is mounted rotatably on the pillar. The top *e* may be lifted by means of the screw *j* acting on the other end of the lever *g*, and then swung out of position. In order to prevent tipping over of the crucible *q* as the furnace is



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opened, a retaining cap *m* may be lowered on to it. The cap is carried by a rod *k*, mounted on a bracket *o*, which is integral with the sleeve *h*. The rod *k* is normally pressed upward by the spring *p*, but may be moved downward to grip the crucible by means of the lever *n*.

132,387. SULPHUR DIOXIDE, MANUFACTURE OF. J. Grayson, 22, Cobcroft Road, Huddersfield. Application date, October 31, 1918.

Sulphuric acid is heated in a retort with 5 to 10 per cent. of coarsely broken pitch up to 170° to 240° C., until the residue in the retort is only sufficiently liquid to be run out. Sulphur dioxide free from oxides of carbon is thus formed. The process may be used for the decomposition of waste sulphuric acid, such as that obtained from the washing of naphtha fractions.

132,398. CRUCIBLE AND LIKE FURNACES, GAS HEATED. South Metropolitan Gas Co. and D. Chandler, 709, Old Kent Road, London, S.E. 15. Application date, November 19, 1918

The heating burner projects transversely into the combustion space which surrounds the crucible, at a level just below the bottom of the crucible. At the back of the burner an opening is provided which is normally closed by a fusible metal plate, so that in the event of breakage of the crucible, the molten material fuses the metal plate and escapes, instead of solidifying within the furnace.

132,433. BENZOIC ACID, MANUFACTURE OF. Dr. F. P. Leach and The United Alkali Co., Ltd., Cunard Building, Liverpool. Application date, February 6, 1919.

Toluene is chlorinated until the product is wholly or mainly benzyl chloride, and 253 parts are then heated with 552 parts of caustic soda and 5,000 parts of water up to 80° to 90° C. Chlorine is admitted during the whole time until the conversion into sodium benzoate is complete, and the mixture is then filtered. Benzoic acid may then be obtained from the sodium benzoate solution by acidulation or otherwise.

International Specifications Open to Inspection

130,962. SOLVENTS, RECOVERING. E. I. Du Pont de Nemours & Co., Wilmington, Del., U.S.A. International Convention date, August 8, 1918.

A current of air is passed over coated surfaces containing volatile solvents, such as methyl, ethyl, and butyl alcohol, methyl and ethyl acetate, benzol, acetone, ethyl methyl ketone and ether. The air containing the solvent vapour is passed through a distillate obtained from wood tar, which is previously freed from alcohol and acids. The distillate has a boiling point of 205° to 245° C., and the solvent vapour is absorbed by it.

130,963. FERTILISERS. C. Rossi, Legnana, Italy. International Convention date, August 9, 1918.

Rock such as leucite, volcanic ash, feldspar, orthoclase, granite, &c., is finely ground and strongly heated with calcium carbide in a stream of nitrogen. The nitrogen is fixed by the rock in a complex compound and also by the carbide as calcium cyanamide, and these may be used as a fertiliser. The potassium compound also formed is volatilised, but may be collected and added to the fertiliser. Lime and carbon may also be added.

130,966. NITROSULPHONIC ACID; SULPHURIC ACID. Norsk Hydro-Elektrisk Kvaelstofaktieselskab, 7, Solligatan, Christiania. International Convention date, August 9, 1918.

Nitrosyl-sulphuric acid or sulphuric acid which has been denitrated and still contains a small quantity of oxides of nitrogen is mixed with not more than 1 per cent. of nitric acid. The acid is thereby prevented from attacking iron receptacles or apparatus.

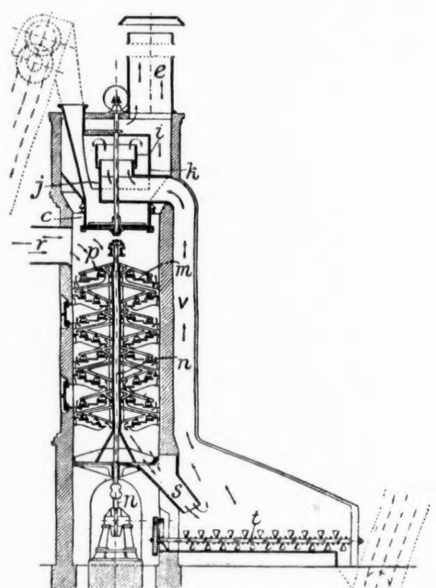
130,968, 130,969, 130,970. ESTERS; DISTILLING. U.S. Industrial Alcohol Co., 27, William Street, New York. International Convention date, August 7, 1918.

An alcohol, an organic acid, and a catalyst are fed continuously to a column still. The process and apparatus for treating methyl alcohol, dilute or glacial acetic acid, and sulphuric acid for the continuous production of methyl acetate are described in detail.

130,978. DRYING, ROASTING, &c., APPARATUS. J. Réol, Cours Gambetta, Lyons, France. International Convention date, August 9, 1918.

Minerals or other powdered materials which are to be dehydrated, reduced, roasted, or calcined, are fed from a hopper c_1 which is provided with a hit-and-miss regulator comprising a disc moving

over the base, which has a number of radial openings. The material is fed on to the uppermost of a number of concentric shelves *m*, which extend outward from the central shaft *n* to the periphery, and back again to the shaft. Several sets of shelves



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are arranged as shown. The material is moved from shelf to shelf by rotating scrapers *p*. The heating, &c., gases pass downward through the shaft from the inlet *r* to the outlet *s*, and thence through the passage *v* to the chimney *e*, or, alternatively, the gases may be passed upward over the descending material. The material is discharged on to a conveyor *t*.

130,979. CALCIUM NITRATE. Nitrum Akt.-Ges., 30, Bahnhofstrasse, Zurich, Switzerland. International Convention date, August 6, 1918.

Oxides of nitrogen are dissolved in water, and the solution neutralised by passing it over limestone in the absorption apparatus, or outside such apparatus. In the latter case, the neutral solution is returned to the apparatus. The neutral solution may be used for further absorption, so that a strong solution of calcium nitrate is obtained.

LATEST NOTIFICATIONS.

133,304. Aliphatic Nitrates, Manufacture of. P. R. de Wilde. September 28, 1918.

133,319. Zinc Chloride, Manufacture of. C. F. Burgess Laboratories. September 26, 1918.

133,320. Phosphates, Apparatus for Enriching Poor. June 20, 1917.

Specifications Accepted, with Date of Application

120,378. Nitric Acid, Manufacture of Concentrated. Norsk Hydro-Elektrisk Kvaelstofaktieselskab. October 30, 1917.

123,735. Fractional Distillation of Liquids, Process and Apparatus for. Soc. d'Etudes Chimiques. February 20, 1918.

132,545. Mixing and Proportioning Gases for Combustion. A. E. Alexander (*Surface Combustion Co.*). December 3, 1917.

132,551. Ammonia, Process and Apparatus for Oxidising—to form Oxides of Nitrogen and Nitric Acid. L. C. Jones and C. L. Parsons. April 30, 1918.

132,557. Acetaldehyde, Process of Manufacturing. H. W. Matheson. June 18, 1918.

132,558. Acetic Acid, Manufacture of. H. W. Matheson. June 18, 1918.

132,571. Ammonia, Burner for the Oxidation of. E. B. Maxted and T. A. Smith. August 12, 1918.

132,572. Peat, Treating—for Obtaining Carbonaceous Material for Decolourising Purposes. J. W. Leadbeater. August 13, 1918

132,576. Coal, Shale, and other like substances, Furnaces for Distillation of. F. A. Anderson, M. Deacon, and N. P. W. Brady. August 14, 1918.

132,586. Gas-cleaning Apparatus. A. J. Liversedge and W. B. Davidson. August 27, 1918.

132,622. Cyanamide, Process for the Production of. F. Gros and Bouchardy. November 3, 1917.

132,635. Electric Furnaces. T. A. D. Lawton and J. Hampton. September 28, 1918.

132,661. Sulphur Dioxide, Process for Recovering Unoxidised—in the Contact Manufacture of Sulphuric Acid. British Dyes, Ltd., J. Turner, and W. B. Davidson. November 1, 1918.

132,704. Sulphuric Acid, Concentration of. F. W. Howorth (*Norsk Hydro-Elektrisk Kvaelstofaktieselskab*). January 22, 1919.

132,744. Furnaces for the Distillation of Coal and like substances. F. A. Anderson, M. Deacon, and N. P. W. Brady. August 14, 1918.

Cheaper Nitrate by a New Process

THE PRESIDENT OF CHILE recently witnessed experiments by Dr. Eduardo Charme, Senator from Colchagua, respecting his reported discovery for cheapening the production of nitrate. His process, it is said, consists of a chemical reagent which precipitates the nitrate without the use of heat, a discovery which it is said will not only revolutionise the production of Chilean nitrate, but will also reduce its cost by more than 50 per cent.—a reduction which, if confirmed, must affect seriously the manufacture of artificial nitrate. According to information furnished by Dr. Charme, the cost of producing a quintal of practically pure nitrate by means of his reagent will be reduced to such an extent as to make it even lower than any of the component parts of synthetic nitrate. He estimates that with the new process the production of 100 kilos. of nitrate will cost 65 centavos of Chilean currency (about 6½d.), not including the cost of the extraction of the caliche or raw product and other expenses incurred up to the time of shipment. The cost of manufacture by the new process will be 80 per cent. lower than that by the old method, and bearing in mind other expenses which cannot be eliminated, the net reduction in cost will be in excess of 50 per cent. Dr. Charme is reported to have shown by experiments made in the presence of the Executive and of a number of experts that the purity of the nitrate obtained by his method was greater than 99 per cent., or the highest grade secured up to the present time in the manufacture of nitrate, since the richness of nitrate made by the old methods is seldom more than 65 per cent. These claims, of course, are of great interest, but it must not be assumed that they have yet been commercially established.

Decline in Chilean Nitrate Output

ACCORDING to a consular report from Valparaiso there has been a heavy decline in the output of Chilean nitrate since the Armistice. Production, it is stated, is less than half what it was a year ago, and only 56 out of 114 plants are now in operation, according to official statistics. At the several ports along the coast conditions are bad on account of the nitrate business being almost at a standstill, and most of the workmen of Bolivian or Peruvian origin are returning home, and the number of Chilean workmen is also much reduced. The Chilean Association of Nitrate Producers is trying to hold up the price of nitrate to 10s. 1d. per quintal (46 kilos. or 101 lb.) in Chilean ports for the so called ordinary or 95 per cent. nitrate, and 10s. 4d. for the refined nitrate (96 per cent.). Some small sales were made by outside sellers recently at 8s. 11d. per quintal for the ordinary, and 9s. 1d. per quintal for some 96.1 per cent. nitrate, but the latter can hardly be considered the market price, as the principal producers belong to the association and must abide by the selling price fixed by that organisation. The association is now discussing the question of reducing the price, but has not yet come to any decision.

Market Report and Current Prices

Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, *and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co. and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The weekly report contains only commodities whose values are at the time of particular interest or of a fluctuating nature. A more complete report and list are published once a month. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.*

Market Report

THURSDAY, October 16, 1919.

TRADE has been very active during the current week, and prices of most products are well maintained, whilst quite a number are showing changes in sellers' favour.

The export demand is also very satisfactory.

General Chemicals

ACID ACETIC is in steady request, and price is likely to be firmer. The Government stocks of synthetic acid appear now to have been disposed of.

ACID CARBOLIC.—This material is not quite so active, but price is maintained.

ACID LACTIC is in steady demand, and price is higher.

ACID OXALIC is in only moderate request at last quoted prices.

AMMONIUM MURIATE is somewhat scarcer for prompt delivery, but without change in price.

BARIUM CHLORIDE is easy, and little business is passing.

BLEACHING POWDER is in slightly better request at the advanced price.

CALCIUM ACETATE.—This material is firmer.

FORMALDEHYDE is in active request, and price is, if anything, the turn higher.

IRON SULPHATE is in brisk demand, but there are still accumulated stocks at some works.

LEAD ACETATE is in better demand, and price shows a tendency to harden.

LEAD NITRATE is also active, with a firmer tendency.

LITHARGE is in steady request at last prices.

POTASSIUM CARBONATE is firmer in price for spot delivery.

SODIUM ACETATE is in slightly better demand, and price now steady.

SODIUM BICARBONATE is wanted for export.

SODIUM CAUSTIC is again higher in price, and some heavy transactions have been concluded.

ZINC SULPHATE is in better request, and the present price, which can only be described as extremely cheap, should shortly harden in sympathy.

Coal Tar Intermediate Products

A very active business has been transacted, and there are some large enquiries in the market.

ANILINE OIL is in continued demand, and a fair amount of business has been concluded.

ANILINE SALT is in active request, but supplies are difficult to obtain for near delivery.

BENZIDINE BASE is wanted, and price is inclined to be firmer.

PARANITRANILINE.—Some important orders have been placed, and price is firmer.

Coal Tar Products

The market for all coal tar products remains very firm, and all prices are showing a tendency to rise.

Forward Business.—Manufacturers are all quoting very high prices for any part of 1920 delivery.

BENZOL.—The price is very firm at about 2s. on rails, and supplies are difficult to procure.

CRESYLIC ACID remains steady at 2s. 5d. per gallon for 97/99, and 2s. 3d. per gallon for 95/97, both prices at works.

CREOSOTE is also fairly active, and the price is 5½d. to 6d. per gallon in the North, and 6½d. to 7d. in the South.

NAPHTHALENE.—There is a fair amount of inquiry, and prices are about £7 per ton for crude and £19 per ton for refined.

SOLVENT NAPHTHA.—The price for solvent naphtha has been rising considerably during the week, and 2s. 4½d. at works has been paid from now to the end of the year. For 1920 business the price of 2s. 6d. has been quoted at works.

HEAVY NAPHTHA remains firm at about 2s. 2d. per gallon, free on rails makers' works.

PITCH.—There is no change.

Sulphate of Ammonia

There is no change.

Current Prices

Chemicals

	per	£	s.	d.		£	s.	d.
Acetic anhydride	lb.	0	2	9	to	0	3	0
Acetone, pure	ton	95	0	0	to	97	0	0
Acid, Acetic, glacial, 99-100%	ton	77	10	0	to	80	0	0
Acetic, 80% pure	ton	65	0	0	to	67	10	0
Carbolic, cryst. 39-40°	lb.	0	0	9	to	0	0	9½
Citric	lb.	0	4	4	to	0	4	5
Lactic, 50 vol.	ton	70	0	0	to	72	10	0
Lactic, 60 vol.	ton	85	0	0	to	87	10	0
Oxalic	lb.	0	1	2	to	0	1	2½
Pyrogallic, cryst.	lb.	0	11	6	to	0	11	9
Tannic, commercial	lb.	0	3	0	to	0	3	3
Tartaric	lb.	0	3	3	to	0	3	4
Alum, lump	ton	17	10	0	to	17	15	0
Aluminium, sulphate, 14-15%	ton	14	10	0	to	15	0	0
Aluminium, sulphate, 17-18%	ton	18	0	0	to	18	10	0
Ammonia, anhydrous	lb.	0	1	9	to	0	2	0
Ammonia, .880	ton	32	10	0	to	37	10	0
Ammonia, carbonate	lb.	0	0	6½	to		—	
Ammonia, muriate (galvanisers)	ton	44	0	0	to	45	0	0
Ammonia, nitrate	ton	55	0	0	to	57	10	0
Ammonia, phosphate	ton	115	0	0	to	120	0	0
Arsenic, white, powdered	ton	60	0	0	to	62	10	0
Barium, carbonate, 92-94%	ton	13	0	0	to	14	0	0
Chloride	ton	23	0	0	to	24	0	0
Nitrate	ton	50	0	0	to	51	0	0
Sulphate, blanc fixe, dry	ton	25	10	0	to	26	0	0
Sulphate, blanc fixe, pulp	ton	15	10	0	to	16	0	0
Bleaching powder, 35-37%	ton	16	10	0	to	17	0	0
Borax crystals	ton	51	0	0	to	53	0	0
Calcium acetate, grey	ton	23	0	0	to	25	0	0
Chloride	ton	8	10	0	to	9	0	0
Casein, technical	ton	80	0	0	to	83	0	0
Cobalt oxide, black	lb.	0	7	9	to	0	8	0
Copper sulphate	ton	40	0	0	to	42	0	0
Cream Tartar, 98-100%	ton	245	0	0	to	250	0	0
Epsom salts (see Magnesium sulphate)								
Formaldehyde 40% vol.	ton	140	0	0	to	145	0	0
Iron perchloride	ton	32	0	0	to	34	0	0
Iron sulphate (Copperas)	ton	4	10	0	to	4	15	0
Lead acetate, white	ton	82	10	0	to	85	0	0
Carbonate (White Lead)	ton	51	0	0	to	55	0	0
Nitrate	ton	58	0	0	to	59	0	0
Lithophone, 30%	ton	44	0	0	to	46	0	0
Magnesium chloride	ton	15	0	0	to	16	0	0
Carbonate, light	cwt.	2	15	0	to	3	0	0
Sulphate (Epsom salts commercial)	ton	11	0	0	to	11	10	0
Sulphate (Druggists')	ton	17	10	0	to	18	0	0
Methyl acetone	ton	89	0	0	to	90	0	0
Alcohol, 1% acetone	gall.	0	11	6	to	0	12	0
Potassium bichromate	lb.	0	1	6	to	0	1	7
Carbonate, 90%	ton	98	0	0	to	100	0	0

	per	£	s.	d.		£	s.	d.
Potassium Chlorate	lb.	0	1	2	to	0	1	3
Meta-bisulphite, 50-52%	ton	224	0	0	to	240	0	0
Nitrate, refined	ton	58	0	0	to	60	0	0
Permanganate	lb.	0	3	6	to	0	3	9
Prussiate, red	lb.	0	6	0	to	0	6	3
Prussiate, yellow	lb.	0	1	9	to	0	1	10
Sulphate 90%	ton	31	0	0	to	33	0	0
Salammoniac, firsts	cwt.	4	0	0	to	—		
Seconds	cwt.	3	15	0	to	—		
Sodium acetate	ton	48	0	0	to	50	0	0
Arsenate, 45%	ton	50	0	0	to	52	0	0
Bicarbonate	ton	9	0	0	to	9	10	0
Bisulphite, 60-62%	ton	32	0	0	to	33	0	0
Chlorate	lb.	0	0	6	to	0	0	6½
Caustic, 70%	ton	23	0	0	to	24	0	0
Caustic, 76%	ton	24	0	0	to	25	0	0
Hyposulphite, commercial	ton	19	0	0	to	19	10	0
Nitrite, 96-98%	ton	58	0	0	to	60	0	0
Phosphate, crystal	ton	28	0	0	to	30	0	0
Prussiate	lb.	0	0	10	to	0	0	10½
Sulphide, crystals	ton	16	0	0	to	16	10	0
Sulphide, solid, 60-62%	ton	22	10	0	to	23	10	0
Sulphite, cryst.	ton	11	0	0	to	11	10	0
Strontium carbonate	ton	85	0	0	to	90	0	0
,, Sulphate, white	ton	8	10	0	to	10	0	0
Sulphur chloride	ton	38	0	0	to	40	0	0
Tin perchloride, 33%	lb.	0	2	4	to	0	2	5
,, Protochloride (tin crystals)	lb.	0	1	9	to	0	1	10
Zinc chloride 102 Tw.	ton	22	0	0	to	23	10	0
Chloride, solid, 96-98%	ton	50	0	0	to	52	10	0
Sulphate,	ton	21	10	0	to	23	0	0
Oxide, Redseal	ton	75	0	0	to	80	0	0

Coal Tar Intermediates, &c.

	per	£	s.	d.		£	s.	d.
Alphanaphthol, crude	lb.	0	3	0	to	0	3	6
Alphanaphthol, refined	lb.	0	3	6	to	0	3	9
Alphanaphthylamine	lb.	0	2	6	to	0	2	9
Aniline oil, drums free	lb.	0	1	2	to	0	1	3
Aniline salts	lb.	0	1	5	to	0	1	6
Anthracene, 85-90%	lb.	0	1	5	to	0	1	6
Benzaldehyde (free of chlorine)	lb.	0	5	6	to	0	6	0
Benzidine, base	lb.	0	6	6	to	0	7	0
Benzidine, sulphate	lb.	0	5	0	to	0	5	6
Benzoic, acid	lb.	0	5	0	to	0	5	3
Benzoate of soda	lb.	0	5	0	to	0	5	3
Benzyl chloride, technical	lb.	0	1	9	to	0	2	0
Betanaphthol benzoate	lb.	1	6	0	to	1	7	6
Betanaphthol	lb.	0	2	4	to	0	2	6
Betanaphthylamine, technical	lb.	0	6	6	to	0	7	0
Dichlorbenzol	lb.	0	0	5	to	0	0	6
Diethylaniline	lb.	0	7	0	to	0	8	0
Dinitrobenzol	lb.	0	1	4	to	0	1	6
Dinitrochlorbenzol	lb.	0	1	2	to	0	1	3
Dinitronaphthaline	lb.	0	1	6	to	0	1	9
Dinitrotoluol	lb.	0	1	10	to	0	2	0
Dinitrophenol	lb.	0	1	3	to	0	1	6
Dimethylaniline	lb.	0	2	9	to	0	3	0
Diphenylamine	lb.	0	3	0	to	0	3	3
H-Acid	lb.	0	11	6	tc	0	12	0
Metaphenylenediamine	lb.	0	4	6	to	0	4	9
Monochlorbenzol	lb.	0	0	9	to	0	0	10
Metanilic Acid	lb.	0	7	6	to	0	8	6
Monosulphonic Acid (2:7)	lb.	0	7	0	to	0	8	0
Naphthionic acid, crude	lb.	0	3	3	to	0	3	6
Naphthylamin-di-sulphonic acid	lb.	0	4	6	to	0	5	0
Nitronaphthaline	lb.	0	1	2	to	0	1	3
Nitrotoluol	lb.	0	1	3	to	0	1	6
Orthoamidophenol, base	lb.	0	18	0	to	1	0	0
Orthodichlorbenzol	lb.	0	1	1	to	0	1	3
Orthotoluidine	lb.	0	2	2	to	0	2	3
Orthonitrotoluol	lb.	0	1	6	to	0	1	9
Para-amidophenol, base	lb.	0	14	0	to	0	15	0
Para-amidophenol, hydrochlor.	lb.	0	15	6	to	0	16	0
Paradichlorbenzol	lb.	0	0	4	to	0	0	5
Paranitraniline	lb.	0	3	6	to	0	3	9
Paranitrophenol	lb.	0	1	10	to	0	2	0
Paranitrotoluol	lb.	0	5	3	to	0	5	6
Paraphenylenediamine, distilled	lb.	0	14	0	to	0	15	0
Paratoluidine	lb.	0	7	0	to	0	7	6
Phthalic anhydride	lb.	0	8	0	to	0	9	0
Resorcin, technical	lb.	0	11	0	to	0	12	0
Resorcin, pure	lb.	0	17	6	to	1	0	0
Salicylic acid	lb.	0	2	9	to	0	3	0
Salol	lb.	0	4	9	to	0	5	0
Sulphanilic acid, crude	lb.	0	1	3	to	0	1	6
Tolidine, base	lb.	0	9	0	to	0	10	0
Tolidine, mixture	lb.	0	2	9	to	0	3	0

A New Motor Fuel

PARTICULARS of a decidedly remarkable new motor fuel are given in the *Times* and are reproduced below for what they are worth. The inventor is Mr. Andrade, a South American, and last week a demonstration was arranged at Nottingham on the grounds of Alderman Ball, who has entered into a provisional arrangement with the inventor to secure the European rights. The fuel, it is stated, is produced by mixing with water a compound known only to the inventor. On some of the liquid being poured on to the ground it burnt steadily and emitted no smoke. Half a bucketful of liquid was afterwards poured into the petrol tank of Mr. Ball's car, which travelled with perfect smoothness and at a high rate of speed. More water was then added, and this seemed, if possible, rather to improve the running of the engine. Mr. Ball states that the car travelled over thirty miles on one gallon, and that if Mr. Andrade's assertions are true a gallon can be manufactured for 5d. It is claimed that the new fuel will prove even more valuable for submarine craft, as practically no air is necessary. Further tests are to be made.

Ducktown Sulphur, Copper, and Iron

Modification of Ore-treating Processes

MR. J. G. GORDON (chairman and managing director), presiding at the twenty-ninth ordinary general meeting of the Ducktown Sulphur, Copper, and Iron Co., Ltd., in London, last week, said that while the development work at the mines had been satisfactory so far as a largely increased tonnage was concerned, the copper content of the ore bodies was considerably lower than the ore they had hitherto treated. Steps had therefore been taken to modify their present process for treating the ore, and a plant, which during the year 1920 should enable the company to treat about 800 tons of ore per day on a seven-day week, was being installed. This would nearly double the output, and would largely reduce all the overhead costs. Since 1910 they had made a small profit out of the sulphur contained in the ore, which was converted into sulphuric acid, but the sulphuric-acid plant had been a great disappointment to everybody. They obtained, as they considered, an excellent contractor to put up the plant, and in the first few years' working it did very well. This plant and that of the Tennessee Copper Co. were the only plants which were producing sulphuric acid from gases from blast furnaces. A great many difficulties were encountered, and the profits were smaller than experts who put up the plant had anticipated, but he hoped that by improved methods, and especially by the better co-ordination of the smelting and acid plants, decidedly better results would be obtained in the future.

Men, Machinery, Motive Power

MR. C. A. MCCURDY, M.P., Parliamentary Secretary to the Food Controller, in a speech at Heston on Thursday, October 9, said there were three things used in making wealth—men, machinery, and motive power. If you want more wealth you have got to speed up either the men, or the machinery, or supply more motive power. It was not any failure or idleness on the part of the workers that crippled and starved our production before the war. Six million men and women did all the rough work for the rest of us, and worked hard enough to do it. How about the machinery and the motive power? Before the war the American worker was far better equipped in this respect than the British working man. He had in his factories, on the average, newer and better machinery—and he had 50 per cent. more motive power, steam power, or electrical power, to help him in his task. We might double the efficiency and the output of British workmen by giving British industry cheap and abundant motive power. Coal is the principal source of England's wealth. Every year we use in this country 80,000,000 tons of coal for motive power. Man for man, we use in industry half as much coal again as they do in America, but we do it so wastefully, so badly, that 1 ton of coal used to assist the worker in the United States gives him 50 per cent. more help, 50 per cent. more motive power, than 1½ tons used to assist the British worker. The Coal Conservation Commission, appointed by the Ministry of Reconstruction during the war, reported that our present consumption of coal for industrial purposes might be made to give at least three times the amount of power. That is one way of increasing production. Treble your motive power. More power means more output, and more output means higher wages.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 4, Queen Anne's Gate Buildings, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

Locality of Firm or Agent.	Materials.	Ref. No.
Canada (Montreal)	Aniline dyes, chemicals	—
Spain (Barcelona)	Chemicals and pharmaceutical products, aniline dyes	874
Switzerland ..	Chemicals	876
Belgium (Tournai)	Dyes, chemical products, caustic potash for soap-makers, tanning materials	862
Czecho-Slovakia	Drugs, chemicals, oils and dyestuffs ..	868
Italy (Rome) ..	Soap	871

Agents' Services Sought.—The representative of a Canadian company manufacturing a synthetic drug, who is at present in England, wishes to appoint a suitable agent of high standing, preferably one who would be prepared to buy outright.

Contracts Open

Drugs.—For Tuberculosis Dispensary, Kenwyn. Particulars from County Tuberculosis Officer, Tregrayth, Kenwyn, Truro.

Manures (Chemical).—For the Metropolitan Asylums Board, London, E.C. Particulars from the office of the Board, Embankment, E.C. Tenders by 10 a.m. October 21.

Seizure of Pyro-Gallic Acid

In the Chancery Division on Tuesday, Mr. R. A. Wright, K.C., applied to Mr. Justice Younger to fix a date for the trial, without pleadings, of the action of Brown & Forth (chemical manufacturers) *v.* Buckley (Chemical Age, Sept. 20 & 27).

Counsel stated that the case was of very considerable importance, both to the plaintiffs, whose goods had been seized and detained by the Manchester Collector of Customs, and to the public generally. It raised the question whether it were possible to practise Tariff Reform by an executive act without the express sanction of Parliament. The plaintiffs had imported a quantity of pyro-gallic acid, which was an ordinary commercial article used in photography. It was seized by the Collector of Customs at Manchester under the colour of a proclamation prohibiting the import of chemicals, and the proclamation purported to be issued under Section 43 of the Customs Consolidated Act, 1876. The contention of the plaintiffs was that there was no power under the Act to issue such a proclamation, or to prohibit the importation of ordinary articles of commerce, and they brought their action for a declaration that the seizure was entirely unauthorized and was a wrongful act. When the matter came before Mr. Justice Greer in the Vacation Court, the judge showed considerable sympathy with the plaintiffs, and said he was inclined to think that their construction of the proclamation was right, but he was unable finally to decide the question on an interlocutory application.

The Attorney-General opposed the application on the ground that every point the plaintiffs wished to raise could be raised on the proceedings already taken by the Crown, under Section 207 of the Act, for the condemnation of the goods, which was the procedure prescribed by the statute. To assent to the application would be encouraging the setting-up of an entirely new system of trying Revenue cases. The action was brought against the wrong defendant, Buckley being merely a subordinate official, who could not return the goods if he were ordered to do so. In these circumstances he could not assist in expediting the trial.

His Lordship said that, in face of the opposition of the Crown, he could not direct that the action should be set down for trial without pleadings. The plaintiffs must proceed in the ordinary way, with pleadings.

Chemical Waste in Pulping Unbarked Wood

The following notes on the waste of chemicals in pulping unbarked wood by the sulphate process are supplied by the Forest Products Laboratory of the U.S. Forest Service:—

In the manufacture of sulphite and mechanical pulp, all bark must be removed from the wood before chipping or grinding, since any fragment of bark finding its way into the pulp makes its appearance as minute black specks in the finished sheet. For soda or sulphate pulp, the cleaning is often not so thorough, since the alkaline digestion tends to destroy the bark. Some mills bark the wood partly or not at all in the manufacture of sulphate pulp. To determine the amount of chemical required to pulp unbarked wood, shipments of unbarked shortleaf yellow pine chips and of clear bark were tested by the Forest Products Laboratory at Madison, Wisconsin. A determination upon a 10-pound sample showed that the unbarked chips contained approximately 96 per cent. wood and 4 per cent. bark on a bone dry basis. Sulphate pulping trials on clear bark showed that 28.6 pounds of caustic soda and 10.6 pounds of sodium sulphite were required per 100 pounds of bone dry bark. A yield of 24.9 per cent. of a gelatinous brownish-black mass, containing pieces of unreduced bark, was obtained. This material could not be screened or washed because it clogged the screen openings. Hand sheets made of it gave physical indications of an extremely hydrated stock, the finished sheets being hard and parchmentised. The results indicate that in pulping a ton of wood (bone dry), consisting of 96 per cent. wood and 4 per cent. bark, 22.9 pounds of caustic soda and 8.5 pounds of sodium sulphite are needed to reduce the bark. The pulp produced from the bark is useless, and, furthermore, produces a variation in colour of the pulp, which makes it difficult to maintain a uniform shade in the finished paper.

Shortage of Vat Dyes in U.S.A.

In order to save the American shirt industry from a critical situation, it appears that the Alien Property Custodian has asked the President to issue an executive order permitting him to send an agent to Paris to buy from the Reparations Commission a six months' supply of German vat dyes to tide over American manufacturers until American-made vat dyes, which are already largely perfected, can be produced in commercial quantities. The difficulty with which the National Association of Shirt Manufacturers is confronted is that washing compounds used in American laundries invariably ruin shirts dyed with any but dyes equal in quality to German vat dyes. The shirt manufacturers expect that through special licences they will always be able to have a six months' supply of dyes on hand, with the option of extending the licence period for two months in emergency until American dyes are fully able to meet their demands. In the meantime it is expected that the Longworth Bill, embodying in law a special licence provision for dyes that cannot be bought in this country, will be favourably considered by both Houses, and stands a fair chance of being passed.

According to a statement made by the American Chemical Association (the *Board of Trade Journal* states), American manufacturers of dyestuffs are spending millions of dollars to meet the expected competition of Germany, and one large corporation, it is stated, has already spent in the neighbourhood of over $1,800,000 in experimenting for the preparation of much-desired colours. The Chemical Association points out that the great cost of promoting a native dye industry comes in putting into practical application on a large scale the work of the laboratory. Of the hundreds of dyes which were manufactured abroad before 1914, there is scarcely one, in the opinion of the Association, which could not be made by American chemists on a small scale under laboratory conditions. When the wholesale operation begins, however, there are many obstacles, which, in the opinion of the Association, can only be overcome by actual practice.

American Coal for Europe

The principal feature of the freight markets (the city correspondent of the *Times* states) seems to be the heavy chartering of steamers to carry coals from the United States to Europe. Ships are being freely chartered for the voyages from Virginia to Marseilles, West Italy, Algiers, and Rotterdam. Spanish and Greek vessels have been specially prominent in this coal trade from the United States. Before the railwaymen's strike, licences were being granted by the Ministry of Shipping to British vessels for the voyages from Virginia to Marseilles and West Italy, but during the strike the issue of licences to British steamers was confined to cases of urgent shipments of coal for replenishing coal depots abroad. Now licences have again been issued for the voyage to Algiers or West Italy. The total quantity of coal from the United States for which transport arrangements are being made appears to be very large indeed. Ship-owners, however, have not lost sight of the reports that an American coalminers' strike at the beginning of next month is a serious possibility.

Company News

AMERICAN CYANAMID CO.—The net profit for the year ended June 30 was $1,621,479. To reserve for income and war excess profits taxes, $175,000; loss for year of subsidiary company (Amalgamated Phosphate Co.), $163,752; and to licences and patents written off, $233,975; leaving $1,048,751. Dividends on the Preferred stock to December 31, 1917, paid April 10 last, and also those to June 30, 1918, paid on July 10 last, absorbed $716,508.00.

BAKU CONSOLIDATED OILFIELDS.—It is announced that the applications received by Baku Consolidated Oilfields for the £1 "A" (Preferred Ordinary) shares offered to shareholders in the four amalgamating companies have been very satisfactory, and the underwriters have been wholly relieved. The number of applications was considerably in excess of 5,000.

BORAX CONSOLIDATED.—The directors have declared a dividend of 6 per cent. per annum, less tax at 6s. in the £, on the Preferred Ordinary shares in respect of the half-year to September 30, 1919. Coupon No. 24 of the Preferred Ordinary share warrants to bearer and the half-yearly coupon No. 41 of the Preference share warrants to bearer will be paid, less tax at 6s. in the £, on and after November 1, at the offices of the company, 16, Eastcheap, E.C. 3.

BRITISH PORTLAND CEMENT MANUFACTURERS.—At an extraordinary general meeting, held on Friday, the resolution passed at a previous meeting, splitting the Preference shares of the company and altering the articles of association was confirmed.

BRYANT & MAY.—The directors have declared a dividend at the rate of 7 per cent. for the half-year to September 30 on the Preference shares, and an interim dividend of 4 per cent., free of tax, on the Ordinary shares, for the same period, payable November 1.

EVANS, SONS, LESCHER & WEBB, LTD.—A prospectus will shortly be issued inviting subscriptions for further capital for Evans, Sons, Lescher & Webb, Ltd., manufacturing chemists, of Liverpool and London. It is understood that Ordinary shares will be issued at a premium.

FORSTER'S GLASS CO.—At the statutory meeting, held on Monday, the chairman (Mr. John Forster) announced that the company is progressing satisfactorily. An interim dividend to September 30 had been paid on the Preference shares; and the directors have declared an interim dividend of 7½ per cent. on the Ordinary shares, also to September 30.

IDRIS HYDRAULIC TIN.—Interim dividend of 6d. per share, less tax at 6s. in the £, payable October 31 to holders on the register at October 8.

IMPERIAL COLD STORAGE AND SUPPLY.—The report for 1918 states that, including £19,250 brought forward, the balance at credit of profit and loss is £41,636, from which the directors recommend the payment of a dividend for the year of 7½ per cent., free of Union dividend tax, against 6¼ per cent. for the preceding year, leaving £15,618 to be carried forward. Debentures in subsidiary undertakings now stand in the balance-sheet at £194,000, the increase of £10,000 representing debentures in another concern acquired during the year.

MAISEL'S PETROLEUM TRUST.—The auditors have now completed their audit and certified the accounts for the period to March 31, 1914. These accounts will be formally submitted to the adjourned annual general meeting, which will be convened on the return to London of Mr. B. Maisel, the managing director, from Roumania, when it will then be possible to present to the meeting a further report on the present position of the company's undertaking and the arrangements made for future working.

PENA COPPER MINES.—The report for 1918 states that there is a loss on the year's working of £6,954, to which must be added amounts advanced to the Cala Railway Company, now written off, £12,304, making a total loss of £19,257. Deducting this from the balance brought in of £83,039, there remains to be carried forward, £63,781.

SPARKLETS, LTD.—This company, which was formed on July 30, 1919, to take over the business of Aerators, Ltd. (established in 1900 to manufacture bulk known as "Sparklets," and syphons and other apparatus for making aerated waters in the home), has issued its prospectus. The authorized capital is £300,000 in £1 shares, of which 125,000 shares have been allotted as purchase consideration to the vendor company. Offers are invited for 100,000 shares of £1 each, at par, on behalf of George Clare & Co., who have acquired the same. The net profits for 1917 were £33,022; and for 1918, £28,081.

TRINIDAD DOMINION OIL.—A debit balance of £2,209 is carried forward, making an increase of £483, being loss for the year 1918.

VAL DE TRAVERS ASPHALTE.—Interim dividend of 3d. per £1 share, as against 1¼ per cent. at this time last year.

VIRGINIA CAROLINA CHEMICAL.—Quarterly dividend of 2 per cent. on the Preferred stock, payable October 15, and a dividend of 1 per cent. on the Common stock, payable November 1.

WHITEHAVEN HEMATITE IRON AND STEEL.—Interim dividend of 3½ per cent. (actual) on Ordinary shares.

Stocks and Shares

Commercial, Industrial, &c.

	Quotations Oct. 8.	Oct. 15.
Alby United Carbide Factories, Lim., Ord.	$\frac{15}{16}$–$1\frac{1}{16}$	$\frac{15}{16}$–$1\frac{1}{16}$
Associated Portland Cement Manufrs. (1900.) Lim., Ord.	10–$10\frac{1}{2}$	11–$11\frac{1}{2}$
Bell's United Asbestos Co., Lim., Ord.	$2\frac{1}{4}$–$2\frac{1}{2}$	$2\frac{3}{8}$–$2\frac{5}{8}$xd
Bleachers' Association, Lim., Ord.	$1\frac{9}{16}$–$1\frac{11}{16}$	$1\frac{5}{8}$–$1\frac{3}{4}$
Borax Consolidated, Lim., Prefd. Ord.	$4\frac{1}{2}$–5	$4\frac{1}{2}$–5
Bradford Dyers' Assoc., Lim., Ord.	$2\frac{3}{16}$–$2\frac{5}{16}$	$2\frac{3}{16}$–$2\frac{5}{16}$
British Aluminium Co., Lim., Ord.	$1\frac{19}{32}$–$1\frac{23}{32}$xd	$1\frac{9}{32}$–$1\frac{23}{32}$
British Oil and Cake Mills, Lim., Ord.	$2\frac{5}{16}$–$2\frac{1}{16}$	$2\frac{3}{8}$–$2\frac{1}{2}$
British Portland Cement Manufrs., Lim., Ord.	$1\frac{5}{8}$–$1\frac{3}{4}$xd	$1\frac{21}{32}$–$1\frac{25}{32}$
Brunner, Mond & Co., Lim., Ord.	$2\frac{3}{8}$–$2\frac{1}{2}$	$2\frac{1}{8}$–$2\frac{1}{4}$
Castner-Kellner Alkali Co., Lim.	$2\frac{5}{8}$–$2\frac{7}{8}$	$2\frac{5}{8}$–$2\frac{7}{8}$
China Clay Corporation, Lim., Ord.	$\frac{1}{4}$–$\frac{3}{8}$	$\frac{1}{4}$–$\frac{3}{8}$
Cook (Edward) & Co., Lim., 4% 1st Mort. Deb. Stock Red.	57–61	57–61
Courtaulds, Lim.	10–11	11–12
Crosfield (Joseph) & Sons, Lim., Cum. 6% Prefce.	$\frac{15}{16}$–$1\frac{1}{16}$	$\frac{15}{16}$–$1\frac{1}{16}$
Curtis's & Harvey, Lim.	$2\frac{9}{16}$–$2\frac{13}{16}$	$2\frac{9}{16}$–$2\frac{11}{16}$
Electro Bleach and By-Products, Ltd., 7% Pref.	.. ..	.. ..
Explosives Trades, Lim., Ord.	19/6–20/6	19/6–20/6
Field (J. C & J.), Lim., Ord.	$1\frac{9}{16}$–$1\frac{13}{16}$	$1\frac{1}{2}$–$1\frac{3}{4}$
Greenwich Inlaid Linoleum (Fredk Walton's New Patents) Co., Lim., Ord.	$\frac{9}{16}$–$\frac{11}{16}$	$\frac{21}{32}$–$\frac{25}{32}$
Harrisons & Crosfield, Lim., 10% Cum. Prefd. Ord.	$1\frac{11}{32}$–$1\frac{15}{32}$	$1\frac{11}{32}$–$1\frac{15}{32}$
India Rubber, Gutta Percha and Tel: Wks. Co., Lim., Ord.	$16\frac{1}{2}$–$17\frac{1}{2}$	$16\frac{1}{2}$–$17\frac{1}{2}$
Lawes' Chemical Manure Co., Lim., Ord.	$5\frac{1}{4}$–$5\frac{3}{4}$	$5\frac{1}{4}$–$5\frac{3}{4}$
Lever Bros., Lim., 6 % Cum. "A" Pref.	19/3–19/9	19/9–20/3
Do. 6½ % Cum. "B" Pref.	20/0–20/6	20/0–20/6
Magadi Soda Co., Lim., Ord.	$\frac{13}{16}$–$\frac{15}{16}$	$\frac{27}{32}$–$\frac{31}{32}$
Manganese Bronze and Brass Co., Lim., Ord.	$\frac{11}{16}$–$\frac{13}{16}$	$\frac{11}{16}$–$\frac{13}{16}$
Maypole Dairy Co., Lim., Defd. Ord.	$\frac{13}{16}$–$\frac{7}{8}$	$\frac{13}{16}$–$\frac{7}{8}$
Mond Nickel Co., Lim., 7% Cum. Pref.	1–$1\frac{1}{8}$	$1\frac{1}{16}$–$1\frac{3}{16}$
Do. 7% Non. Cum. Pref.	$\frac{15}{16}$–$1\frac{1}{16}$	$\frac{15}{16}$–$1\frac{1}{16}$
Pacific Phosphate Co., Lim., Ord.	$4\frac{7}{8}$–$5\frac{1}{8}$	$4\frac{7}{8}$–$5\frac{1}{8}$
Power-Gas Corporation, Lim., Ord.	$\frac{3}{4}$–$\frac{7}{8}$	$\frac{3}{4}$–$\frac{7}{8}$
Price's Patent Candle Co., Lim.	90–95	90–95
Salt Union, Lim., Ord.	$1\frac{15}{32}$–$1\frac{19}{32}$	$1\frac{21}{32}$–$1\frac{25}{32}$
United Alkali Co., Lim., Ord.	$1\frac{1}{4}$–$1\frac{1}{2}$	$1\frac{1}{4}$–$1\frac{1}{2}$
Val de Travers Asphalte Paving Co., Lim.	1–$1\frac{1}{8}$	1–$1\frac{1}{8}$
Van den Berghs, Lim., Ord.	$3\frac{1}{2}$–$3\frac{3}{4}$xd	$3\frac{1}{2}$–$3\frac{3}{4}$
Walkers, Parker & Co., Lim.	$1\frac{5}{32}$–$1\frac{9}{32}$	$1\frac{3}{16}$–$1\frac{5}{16}$
Welsbach Light Co., Lim.	2–$2\frac{1}{4}$	2–$2\frac{1}{4}$

Gas, Iron, Coal and Steel

Armstrong (Sir W. G.) Whitworth, Ltd., Ord.	38/0–39/0xd	40/3–41/3
Ebbw Vale Steel, Iron & Coal Co., Lim., Ord.	$1\frac{9}{32}$–$1\frac{11}{32}$	26/0–27/0
Gas Light and Coke Co., Ordinary Stock (4% Stand.)	58–61	58–61
Hadfield's, Limited, Ordinary	39/0–41/0	39/0–41/0
South Metropolitan Gas Co., Ordinary (4% Stand.)	58–61	58–61
Staveley Coal & Iron Co., Lim., Ord.	$1\frac{3}{4}$–$1\frac{7}{8}$	$1\frac{3}{4}$–$1\frac{7}{8}$ d
Vickers, Limited, Ordinary	35/0–36/0	35/3–36/3

Mines, Nitrate, &c.

Anglo-Chilian Nitrate and Rly. Co., Ltd., Ord.	$15\frac{1}{4}$–$15\frac{3}{4}$	$15\frac{1}{2}$–16
Antofagasta Nitrate Co. Compañia de Salitres de Antofagasta) 5½% 1st. Mt. Debs. Red.	88–93	88–93
Lagunas Nitrate Co., Lim.	1–$1\frac{1}{4}$	$1\frac{1}{8}$–$1\frac{3}{8}$
Rio Tinto Co., Lim., Ord. (Bearer)	52–54	52–54
Tarapacá and Tocopilla Nitrate Co., Lim.	17/0–18/0	17/6–18/6

Oil and Rubber

Anglo-Java Rubber & Produce Co., Lim.	7/3–7/9	7/6–8/0
Anglo-Maikop Corporation, Ltd., Ord.	6/3–7/3	7/0–8/0
Anglo-Malay Rubber Co., Lim.	14/$1\frac{1}{2}$–14/$7\frac{1}{2}$	14/3–14/9xd
Anglo-Persian Oil Co., Lim., Cum. 6 % Part.	$1\frac{5}{16}$–$1\frac{3}{8}$	$1\frac{5}{16}$–$1\frac{3}{8}$
Burmah Oil Co. Ltd., Ord.	$14\frac{3}{4}$–15	$14\frac{1}{2}$–$14\frac{3}{4}$
Chersonese (F.M.S.) Estates, Lim.	4/0–4/3	4/$1\frac{1}{2}$–4/$4\frac{1}{2}$
Mexican Eagle Oil Co., Lim. (Cia Mexicana de Pet. "El Aguila" S.A.) Ordinary	$10\frac{15}{16}$–10[illegible]	$10\frac{13}{32}$–$10\frac{13}{32}$
"Shell" Transport and Trading Co., Lim., Ord.	$9\frac{5}{8}$–$9\frac{7}{8}$	$9\frac{3}{16}$–$9\frac{7}{16}$
Do. 5% Cum. Pref.	$9\frac{1}{8}$–$9\frac{3}{8}$	$9\frac{1}{4}$–$9\frac{1}{2}$ d

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

LONDON GAZETTE.

Partnership Dissolved

BENTLEY, John, BAINES, William, and MARSHALL, Thomas Percy Douglas, synthetic leather manufacturers, Shearbridge Road, Bradford, under the style of The Bradford Synthetic Leather Co., by mutual consent as and from September 24. All debts received and paid by John Bentley. William Baines and Thomas Percy Douglas Marshall will continue the business in co-partnership under the same style and at the same address.

Bankruptcy Information

BLACKWELL, Richard G., 5, Hornby Road, Old Trafford, Manchester, representative of a Chemical Company. October 8.

Application for Debtor's Discharge

SWITHENBANK, Harold, 132, Beeches Road, West Bromwich, Staffordshire, analytical chemist. November 11, 11 a.m., Law Courts, Lombard Street West, West Bromwich.

Companies Winding up Voluntarily

BISSOE TIN SMELTING AND ARSENIC CO., LTD.—Mr. Reginald Bernard Petre, Chartered Accountant, 11, Ironmonger Lane, London, appointed Liquidator. Meeting of creditors at the offices of Messrs. W. B. Peat & Co., 11, Ironmonger Lane, London, E.C., at 11 a.m., on Tuesday, October 21.

ISLE OF WIGHT CEMENT WORKS, LTD.—Mr. Robert Ewart Crane, Cathedral House, 8, Paternoster Row, London, Incorporated Accountant, appointed Liquidator. Meeting of creditors at Cathedral House, 8, Paternoster Row, London, E.C. 4, on October 22, at 12 noon.

Mortgages and Charges

[*NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, created after July 1st, 1908, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges which would, if created after July 1, 1908, require registration. The following Mortgages and Charges have been so registered. In each case the total debt, as specified, in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced since such date.*]

BARKERSHAW CHEMICAL CO., LTD., BRADFORD.—Registered October 3, mortgage or charge for securing all moneys due or to become due, to the National Provincial and Union Bank of England, Ltd.; charged on land and stabling and workshop thereon, being 52A, Heaton Road, Bradford.

PARK CHINA CLAY CO., LTD., LISKEARD.—Registered October 4, £8,000 debentures; general charge (except the cottages erected on Whitebarrow Farm). *£3,000. January 13, 1919.

Satisfactions

ADAMS BRITISH OIL CO., LTD., DEPTFORD, S.E.—Satisfaction registered October 3, £3,000, registered July 3, 1908.

STANDARD STEEL CO., LTD., CROYDON.—Satisfactions registered October 8, £2,600, registered August 11, 1910; £1,500, registered July 29, 1911; £300, registered September 26, 1912; £900, registered November 23, 1912; £800 registered August 14, 1913; and all moneys due, &c., not exceeding £2,000, registered September 28, 1913.

New Companies Registered

The following list has been prepared for us by Jordan & Sons, Ltd., company registration agents, 116 and 117, Chancery Lane, London, W.C. :—

GLOBE OILFIELDS, LTD., Finsbury Pavement House, E.C.—To carry on the business of extracting, pumping, drawing, transporting, purifying and dealing in petroleum and other mineral oils. Nominal capital, £250,000 in 500,000 shares of 10s. each. Minimum subscription, 7 shares. Directors: To be appointed by subscribers. Qualification of Directors, £100. Remuneration of Directors, £150 each. Chairman, £200.

HEATHS (LONDON), LTD.—Chemists, druggists, drysalters, oil and colourmen. Nominal capital, £5,000 in 5,000 shares of £1 each. Directors: E. N. Heath, 41, Penny Lane, Liverpool; J. S. M. Mocatta, 27, Ullett Road, Liverpool. Qualification of Directors, £50.

LOWER LANSALSON CHINA CLAY CO., LTD., 17, Albion Street, Hanley, Stafford.—Manufacturers and dealers of china, clay, china stone, &c. Nominal capital, £100,000 in 100,000 Ordinary shares of £1 each. Directors: J. Dixon, W. W. Wood (Junior), P. Duxbury, N. Duxbury, A. D. S. Stocker, W. M. G. Stocker. Qualification of Directors, 500 Ordinary shares.

MATTHEW MARSHALL, LTD., Emerson Chambers, Blackett Street, Newcastle-upon-Tyne.—Oil and grease refiners, soap makers and candle makers, &c. Nominal capital, £10,000 in 10,000 shares of £1 each. Directors: M. Marshall, Isabella Marshall, W. N. Taylor. Qualification of Directors, 1 share.

NAFLAME PAINT, LTD., 1, Quality Court, Chancery Lane, W.C. 2.—Varnish and colourmen. Nominal capital, £6,000 in 6,000 shares of £1 each. Directors: K. Henderson, W. A. Westley, A. Hutchinson, F. Hill-Cole. Qualification of Directors, 200 shares. Remuneration of Directors, £200 each. Chairman, £250.

PETTIT & SONS (Northampton), LTD., Monks Pond Street, Northampton.—Tanners and manufacturers of leather. Nominal capital, 60,000 in £60,000 shares of £1 each. Directors: G. W. Pettit, Sunnynook, St. George's Avenue, Northampton; J. T. H. Pettit, Boughton, near Northampton; W. Hamp, 2, Colwyn Road, Northampton; A. Handscombe, Sunnyside, New Duston, Northampton. Qualification of Directors, 100 shares. Per. Director, 5,000 shares.

TEMBULAND COAL, IRON AND CHEMICAL CO., LTD., 25, Rood Lane, E.C. 3.—Manufacturing chemists, &c. Nominal capital, £100,000 in 210,000 Cumulative Preference shares of 2s. each and 79,000 Ordinary of £1. Directors: W. Mears, J. M. Hood, H. J. Goodall. Qualification of Directors, £500.

TUMBLERS, LTD., 47, Temple Row, Birmingham.—To acquire the Corbett process of glass manufacture. Nominal capital, £31,500 in 30,000 6 per cent. Cumulative Participating Preference shares of £1 each and 30,000 Deferred Ordinary shares of 1s. each. Minimum subscriptions, 6,000 Cumulative Preference Participating shares. Directors: E. H. Norris, 68, Bumbury Road, King's Norton, Birmingham; G. H. Corbett, Church Square, Oldbury, Worcester; C. Whittaker, 1, Lickey Road, Rednal, near Birmingham; G. Cooke, 79, Stanmore Road, Edgbaston, Birmingham. Qualification of Directors, £100.

VICTORIA CHEMICAL WORKS, LTD., 83–88, Minories, E. 1.—Manufacturing chemists and druggists. Nominal capital, £3,000 in 3,000 Ordinary shares of £1 each. Directors: A. H. Pickering (Managing Director); H. J. Mace, H. G. Campion. Qualification of Directors, 1 share.